APPENDIX A
FIELD SAMPLING AND ANALYSIS PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NEWTOWN CREEK

Prepared by

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October 2011

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LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
^{137}Cs	Cesium-137
^{210}Pb	Lead-210
^{7}Be	Beryllium-7
ADCP	Acoustic Doppler Current Profiler
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirements
ASOS	Automated Surface Observation System
BAZ	Biologically Active Zone
BERA	Baseline Ecological Risk Assessment
C	Celsius
CAB	Civil Aeronautics Board
CADD	Computer-Aided Drafting and Design
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
cm	Centimeter
COC	Chain-of-Custody
COPC	Constituent of Potential Concern
CSM	Conceptual Site Model
CSO	Combined Sewer Overflow
CTD	Conductivity, Temperature, Depth
DGPS	Differential Global Positioning System
DMP	Data Management Plan
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DOT	Department of Transportation
DQO	Data Quality Objectives
DTM	Digital Terrain Modeling
EDD	Electronic Data Deliverable

EIS	Environmental Impact Statement
EQuIS	Environmental Quality Information System
ERA	Ecological Risk Assessment
ESI	Environmental Site Inspection
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FOIA	Freedom of Information Act
FS	Feasibility Study
FSAP	Field Sampling and Analysis Plan
GC/MD	Gas Chromatographic/Multi-Detector Detection
GIS	Geographic Information System
GPS	Global Positioning System
H_2S	Hydrogen Sulfide
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HRMS	High Resolution Mass Spectrometer
Hz	Hertz
ID	Identification
IDW	Investigation-Derived Waste
IRT	Interborough Rapid Transit
JPEF	Joint Photographic Experts Group
kHz	Kilohertz
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NAVD	North American Vertical Datum
NELAP	National Environmental Laboratory Accreditation Program
NOAA	National Oceanic and Atmospheric Administration
nT	Nanotesla
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYLI	New York Long Island
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

NYSDOT	New York State Department of Transportation
OBS	Optical Backscatter Detectors
OSHA	Occupational Safety and Health Administration
OU6	Operable Unit 6
PAH	Polycyclic Aromatic Hydrocarbons
PAR-HHRA	Pathway Analysis Report
PC	Personal Computer
PCB	Polychlorinated Biphenyl
PDF	Portable Document Format
PID	Photoionization Detector
POSO	Project On-site Safety Officer
PPE	Personal Protective Equipment
PUF	Polyurethane Foam
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
SLERA	Screening Level Ecological Risk Assessment
SMIA	Significant Maritime Industrial Area
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TCL	Target Compound List
TDS	Total Dissolved Solids
THA	Task Hazard Analysis
TIF	Tagged Image File
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers

USCG	United States Coast Guard
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

This Field Sampling and Analysis Plan (FSAP) presents the procedures for implementing the field work for the Newtown Creek Remedial Investigation/Feasibility Study (RI/FS) as described in the RI/FS Work Plan (AECOM 2011). This work is being performed under an Administrative Order on Consent (AOC) between the Respondents to the AOC and the United States Environmental Protection Agency (USEPA) in the USEPA *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* program. The AOC was entered into voluntarily by the USEPA and Phelps Dodge Refining Corporation, Texaco, Inc., BP Products North America Inc., The Brooklyn Union Gas Company d/b/a National Grid NY, ExxonMobil Oil Corporation, and The City of New York. The RI/FS Study Area is defined in the AOC as Newtown Creek and its tributaries (Dutch Kills, Maspeth Creek, Whale Creek, East Branch, and English Kills) having an approximate 3.8-mile reach (Figures 1-1 and 1-2) to the high water mark.[1] This FSAP, along with the Health and Safety Plan (HASP; Anchor QEA 2011a), Quality Assurance Project Plan (QAPP; Anchor QEA 2011b), Data Management Plan (DMP; Anchor QEA 2011c), and a Community Involvement Plan (CIP; Anchor QEA 2011d) are supporting plans to the RI/FS Work Plan (AECOM 2011).

The purpose of this FSAP is to provide sufficient information for field teams to properly conduct data collection and sampling and sampling processing activities, and to describe the methods and procedures to be implemented during RI field activities in order to meet the RI/FS objectives (see Section 1.3). The FSAP is organized into 16 sections. Section 1 provides the Study Area background and history, a summary of the conceptual site model

1 The Newtown Creek Superfund Site Study Area is described in the AOC as encompassing the body of water known as Newtown Creek, situated at the border of the boroughs of Brooklyn (Kings County) and Queens (Queens County) in the City of New York and the State of New York, roughly centered at the geographic coordinates of 40° 42' 54.69" north latitude (40.715192°) and 73° 55' 50.74" west longitude (-73.930762°), having an approximate 3.8-mile reach, including Newtown Creek proper and its five branches (or tributaries) known respectively as Dutch Kills, Maspeth Creek, Whale Creek, East Branch, and English Kills, as well as the sediments below the water and the water column above the sediments, up to and including the landward edge of the shoreline, and including also any bulkheads or riprap containing the waterbody, except where no bulkhead or riprap exists, then the Study Area shall extend to the ordinary high water mark, as defined in 33 CFR §328(e) of Newtown Creek and the areal extent of the contamination from such area, but not including upland areas beyond the landward edge of the shoreline (notwithstanding that such upland areas may subsequently be identified as sources of contamination to the waterbody and its sediments or that such upland areas may be included within the scope of the Newtown Creek Superfund Site as listed pursuant to Section 105(a)(8) of the CERCLA).

(CSM) as it is currently understood, and the goals and objectives of the Phase 1 RI Field Program.

Section 2 presents the project organization and individual roles and responsibilities for implementation of the first phase of the RI.

Preparation activities required to complete the Phase 1 RI Field Program, such as mobilization/demobilization, permitting, and Study Area facilities/logistics are discussed in Section 3. This section also presents a list of the standard operating procedures (SOPs) that will be followed during the RI implementation.

Sections 4 through 12 present the major Phase 1 RI Field Program tasks to be conducted, including bathymetric, side-scan sonar, and magnetic surveys; aerial photography survey and shoreline assessment; sediment sampling; surface water monitoring and sampling; current meter deployments; supplemental data collection; and habitat and biological evaluations. Each section includes an overview of the activity, the rationale and design of the activity, the procedures that will be followed, and a description of how data will be managed, evaluated, and reported. Each section of this FSAP has been developed as a "stand-alone" guide to the sampling activities discussed in that section, so that field staff can complete the sampling with the information contained in that section and the associated SOPs. As a result, there is some duplication between sections where similar tasks are being completed. The Phase 1 RI Field Program includes a groundwater sampling task that will be scoped in the Phase 1 RI Work Plan Addendum at approximately the midpoint of the Phase 1 RI Field Program. This addendum will include the applicable FSAP procedures.

Quality assurance (QA) and quality control (QC) procedures to be followed during implementation of the RI are presented in Section 13, and field documentation requirements and sample management procedures are discussed in Section 14. Collection and handling of investigation-derived waste (IDW) is discussed in Section 15, and references used in the preparation of the FSAP are provided in Section 16.

1.1 Study Area History and Background

The following section provides a brief summary of the Study Area history and background. A more detailed presentation of Study Area history and background information is provided in Section 1.0 of the RI/FS Work Plan (AECOM 2011).

The Newtown Creek area of Brooklyn and Queens has a history of extensive industrial development dating back to the 1800s. This development resulted in major reworking of the banks and channel for drainage and navigation purposes. The channelizing and deepening of Newtown Creek and its tributaries was largely completed to its current configuration by the 1920s and 1930s (NYCDEP 2007). This historical development has resulted in changes in the nature of Newtown Creek and its tributaries from a natural drainage condition to one that is largely governed by engineered and institutional systems. Based on the current zoning around Newtown Creek and its tributaries, the current predominant land use includes industrial, manufacturing, transportation, and utility facilities (Figure 1-3).

The first survey of Newtown Creek was completed by Dutch explorers in 1613 to 1614, and the Dutch acquired the area from the local Mespatches tribe shortly thereafter. Initially, the Newtown Creek area was used primarily for agriculture, but following the Revolutionary War, it became industrialized with glue and tin factories, rope works, tanneries, and the Sampson Oil Cloth Factory operating along Newtown Creek and its tributaries. There was a shift to shipbuilding in the Pre-Civil War Period. Following the Civil War, textile manufacturing and oil refining replaced shipbuilding along Newtown Creek and its tributaries. Newtown Creek was home to the first kerosene refinery and the first modern oil refinery in the United States, paving the way for the area to become the most industrialized in the United States by the 1900s. With industry came the establishment of the Long Island Railroad Hub (1861), the Queensboro Bridge (1909), and the Interborough Rapid Transit (IRT) subway line (1917). Many of the industries in the Newtown Creek area discharged waste directly into Newtown Creek and its tributaries; upland spills of waste also eventually seeped into Newtown Creek and its tributaries. Following World War II, transport of raw materials and finished goods shifted from waterways to highways and the industrial activities along Newtown Creek and its tributaries declined. By the early 1980s, the historical industrial activities had generally ceased along Newtown Creek and its tributaries and were replaced by industries such as cement plants, scrap yards, a construction supply company, bulk storage terminal, and liquid natural gas storage.

In the mid to late 1800s, sewer lines that discharged into Newtown Creek and its tributaries were constructed. The lines in Queens were connected to the Bowery Bay wastewater treatment plant (WWTP), which went on line in 1938, and the lines in Brooklyn were connected to the Newtown Creek WWTP, which went on line in 1967. Both sewer systems include combined sewer overflows (CSOs) that periodically discharge primarily stormwater mixed with sanitary sewage into Newtown Creek and its tributaries during certain wet weather events.

Newtown Creek and its tributaries have a long tradition of maritime use extending back to the 1800s. This maritime use continues today. The majority of the area surrounding the Study Area is designated by New York City (NYC) as one of the City's six Significant Maritime and Industrial Areas (SMIA), see Figure 1-4. The *New York City Comprehensive Waterfront Plan* (NYC Department of City Planning 1992) and the *New York City Waterfront Revitalization Program* (NYC Department of City Planning 2002) describe SMIAs as areas where the City wants to support a future use as a functioning industrial waterfront. Specifically, the *New York City Comprehensive Waterfront Plan* (NYC Department of City Planning 1992) states that the "[f]undamental objectives of the waterfront plan are to facilitate and encourage water dependent uses and to ensure the retention of sufficient manufacturing-zoned land to accommodate future needs." As part of the SMIA classification, the majority of the uplands adjacent to the Study Area are zoned M3-1, or heavy industrial. This relatively large area of heavy industrial zoning surrounding the Study Area provides sufficient industrial land to support a working waterfront. NYC's designation of the Study Area as a SMIA reflects NYC's determination that the anticipated future uses of surrounding property include maritime industrial uses as well as other compatible industrial uses.

1.2 Conceptual Site Model

The CSM is a representation of the physical, chemical, and biological processes that affect the transport of constituents of potential concern (COPCs) from sources to receptors within the system (NYSDEC 2010). As such, the CSM provides the current understanding of processes affecting the Study Area. The CSM will be updated throughout the RI/FS process as new information becomes available. Updates of the CSM will be subject to USEPA's review and approval, pursuant to the AOC. The CSM will eventually be used as a tool to help select appropriate remedies for the Study Area.

A successful CSM describes:

- Sources of potentially significant loadings of COPCs
- Nature and extent of COPCs
- Important fate and transport characteristics
- Potential exposure pathways
- Potentially impacted receptors

The CSM becomes the framework which supports development of questions that define whether there are unacceptable risks that warrant consideration during the development of the remedial strategy.

The CSM for Newtown Creek as it is understood based on currently available information is presented in Section 2.0 of the RI/FS Work Plan (AECOM 2011). This CSM is presented graphically in Figure 1-5.

1.3 RI/FS Goals and Objectives

The goal of the RI/FS is to conduct a scientifically sound, comprehensive investigation of the Study Area following the appropriate USEPA and New York State Department of Environmental Conservation (NYSDEC) guidance documents and the principles outlined in the USEPA *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) for the purpose of providing the basis for sound scientifically based decisions on the future condition of the Study Area. The following specific objectives have been established to achieve this goal:

1. Identify, quantify, and understand the vertical and horizontal distribution of COPCs in sediment and surface water, and other constituents and stressors that may impact the ecology and quality of the Study Area sediment, water, and biota. This will

include a complete characterization of COPCs in the Study Area, notwithstanding whether the initial release included petroleum or any other substance. The synergistic relationships among substances will be considered to the extent necessary for such characterization.

2. Identify and quantify ongoing significant loadings of COPCs and, to the extent of the available information, sources of such loadings to the Study Area surface water, sediments, groundwater, and biota. In the case of ongoing upland sources, refer future investigation of sources to the appropriate regulating agency (i.e., the USEPA, the NYSDEC, or the NYC Department of Environmental Protection [NYCDEP]). For more details on evaluation of upland sources see Section 3.2.4 of the RI/FS Work Plan (AECOM 2011). As stated in USEPA *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005), sources of contaminants to sediments must be controlled early and if recontamination is likely to occur, then sources should be controlled prior to establishing end points and prior to the implementation of sediment remedies. Therefore, it is important to identify and control significant sources of contaminants to the Study Area, prior to implementing an effective remedy.
3. Understand the key geomorphological, chemical, and biological processes affecting the stability of sediments and the fate, transport, and bioavailability of COPCs.
4. Identify complete and reasonably potentially complete (considering the urban nature of the Study Area and the impact of future contaminant loadings on the ecology and quality of the Study Area) exposure pathways and identify potential current and future human health and ecological risks posed by the COPCs present in the Study Area.
5. Identify and evaluate potential remedial actions that provide meaningful risk reduction and provide the highest, best possible use of the Study Area, and that also consider the urban nature of the Study Area and the impact of future contaminant loadings on the ecology and quality of the Study Area.

1.4 Phased Investigation Approach

The proposed approach for completion of the RI/FS includes phasing of field investigations and associated evaluations and reporting. Per USEPA *CERCLA* Guidance (1988, Section

1.4.2), "field sampling should be phased so that the results of the initial sampling efforts can be used to refine plans developed during scoping to better focus subsequent sampling efforts. Data quality objectives (DQOs) are revised as appropriate based on an improved understanding of the site to facilitate a more efficient and accurate characterization of the site and, therefore, achieve reductions in time and cost." The DQO process is described in *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA 2006). The DQOs established for the Newtown Creek RI/FS are presented in the QAPP (Anchor QEA 2011b). The proposed approach includes two, or possibly more, primary phases of field investigation and the associated evaluation and reporting steps, as described below.

- **Phase 1 RI Field Program** – The Phase 1 RI Field Program considers available pre-RI data and proposes collection of sediment, surface water, ambient air, and groundwater samples, and completion of physical, biological, and shoreline area surveys. The specific sampling anticipated to be performed during this first phase of work is summarized in Table 1-1. This phase of work is intended to generally characterize the physical properties of the Study Area, identify areas of interest or significant features for future sampling during the Phase 2 RI Field Program or the Baseline Ecological Risk Assessment (BERA) Field Sampling Program, and characterize the nature and extent of COPCs in sediment and surface water. The ambient air sampling will evaluate baseline concentrations of specific airborne chemicals for current conditions, measure the level of ambient air concentrations that would be experienced within the breathing zone in or adjacent to the Study Area, and estimate the portion of the measured concentrations that are potentially attributable to the Study Area and its shoreline. Groundwater samples will be collected to identify significant loadings of COPCs and, to the extent of the available information, sources of such loadings to the Study Area.
- **Historical Data Review** – This data review will be conducted prior to and concurrent with the Phase 1 RI Field Program. It will include an evaluation of the available historical data regarding geology, hydrogeology, and land use with the purpose of identifying sources of significant loadings of COPCs, and to the extent of the available information, sources of such loadings, that may impact Study Area biota, sediments, and surface water through groundwater discharge and point and nonpoint source discharges.
- **Screening Level Ecological Risk Assessment (SLERA) and BERA Problem**

Formulation – These activities will be conducted concurrently with the Phase 1 RI Field Program using existing (pre-Phase 1 RI) data and will incorporate the data collected during the Phase 1 RI Field Program habitat survey and biological surveys. The SLERA and the BERA Problem Formulation are intended to be combined into one document. This document will be produced following a BERA Workshop where preliminary SLERA results and a BERA Problem Formulation outline will be discussed in detail with USEPA. These activities will be conducted prior to the completion of the BERA Work Plan to allow identification of data gaps that will be addressed in the BERA Field Sampling Program.

- **Phase 2 RI Field Program** – The Phase 2 RI Field Program will be completed following the review of historical data, e.g., existing reports on upland properties (including geology and hydrogeology), information on pipe discharges, and observations of pipe discharges, seeps, and nonpoint source stormwater flow in the Study Area. Phase 1 RI Field Program data (e.g., results of shoreline assessment and groundwater sampling) will be incorporated into the design of the Phase 2 RI Field Program. This phase of work will include sampling of the pipes, seeps, and, to the extent necessary to identify significant loadings of COPCs, nonpoint source stormwater and groundwater (using in-creek techniques and/or land-based monitoring wells). Should an upland site ultimately require the installation of upland wells to fully characterize the upland contaminant loadings, this characterization will be the subject of the process outlined in RI/FS Work Plan (AECOM 2011) Section 3.2.4 and AOC Section XI, Paragraph 54.e and AOC Section XII, Paragraph 58.b. The objective of this phase of work is to complete the identification of ongoing sources of significant loadings of COPCs, and to the extent of the available information, sources of such loadings, to the Study Area.

  Specifically, the Phase 2 RI Field Program is intended to identify significant contaminant loadings from point and nonpoint source discharges to the Study Area (including groundwater) having potential significant impact on the implementation of an effective remedy. Identification of sources of significant contaminant loadings will use a multiple-lines-of-evidence approach consisting of: 1) information obtained from the aforementioned Historical Data Review; 2) Phase 1 RI Field Program data obtained from the shoreline assessment and sampling of various media; and 3) Phase 2

RI Field Program in-creek assessment methodologies (including use of a Trident Probe, or similar sampling technology and/or groundwater monitoring wells). Additionally, the Phase 2 RI Field Program will include collection of physical and/or chemical data to fill data gaps identified at the end of the Phase 1 RI Field Program and will include the collection of the data needed to support the Human Health Risk Assessment (HHRA).

- **BERA Field Sampling Program** – The BERA Field Sampling Program will rely on pre-RI data and the initial findings of the Phase 1 RI Field Program, including the findings of the habitat survey, to focus ecological data collection to the appropriate locations, and the results of the SLERA and of the BERA Problem Formulation. This phase of field work will focus on collecting the information necessary to complete the Ecological Risk Assessment (ERA).
- **RI Reporting** – The results of the RI data collection activities will be summarized in several reports. A Phase 1 RI Interim Data Report will be prepared prior to approximately the midpoint of the Phase 1 RI Field Program to summarize the results of the surveys performed (bathymetric, side-scan sonar, and magnetic surveys, aerial photography survey, and shoreline assessment) and the Historical Data Review information obtained up to that point in time, including the groundwater assessment. This interim data report will serve as the basis to identify potential significant loadings of COPCs and, to the extent of the available information, sources of such loadings to the Study Area for consideration of Phase 1 in-creek and/or land-based sampling. The results of the Phase 1 RI Field Program will be summarized in the Phase 1 RI Data Summary Report. As needed, additional interim data reports will be prepared during the various phases of RI field work. The combined results from the Phase 1 and Phase 2 RI Field Programs will be summarized in the RI Report.
- **BERA** – The BERA will rely on the results of the Phase 1 and Phase 2 RI Field Programs, the BERA Field Sampling Program, and the food web modeling (as described in Section 2.3.1.4 of the RI/FS Work Plan [AECOM 2011]).
- **HHRA** – The HHRA will be outlined for discussion and comment by USEPA in the Pathway Analysis Report (PAR-HHRA). The PAR-HHRA will include the HHRA CSM and details of exposure and toxicity data to ensure the approach for the HHRA is acceptable to USEPA. The HHRA will involve a review of sampling data for environmental media associated with the Study Area collected during the Phase 1 RI,

Phase 2 RI, and BERA Field Programs and will also rely on the results of the food web modeling (as described in Section 2.3.1.4 of the RI/FS Work Plan [AECOM 2011]).

- **FS Field Program** – The FS Field Program, if necessary, will be scoped following the completion of the RI, ERA, and HHRA. This phase of field work will provide the information needed to complete the FS and may include additional sediment sampling in select areas of the Study Area for specific constituents, sediment sample collection to refine volumes for remediation areas, and treatability tests for candidate remedial technologies.

The field programs of the RI/FS are not intended to be completed sequentially, but will be scheduled and implemented as information is obtained to enable execution of the field programs and as USEPA approval of field program scope is obtained.

1.5 Phase 1 Goals and Objectives

The primary goals of the Phase 1 RI Field Program are focused on extending the current understanding of sediment impacts throughout the Study Area, the stability of these sediments, and identifying potential past and current sources of these impacts. The overall objectives and proposed work scope developed for the Phase 1 RI Field Program in order to achieve these goals are presented below:

1. Broadly characterize the physical properties and chemical nature of the sediments and surface water and the bottom conditions (debris and obstructions) along the length of the Study Area. This objective will be achieved by conducting physical surveys of the Study Area (bathymetric, side-scan sonar, and magnetic surveys), and collecting and analyzing surface sediment samples, subsurface sediment samples, and surface water samples. These data will provide information on the geometry of the bottom of Newtown Creek and its tributaries, general characterization on a large scale (e.g., subsurface and surface sediment samples will be collected spatially along the Study Area at approximately 1,000-foot intervals) of the presence and distribution of COPCs in sediments, seasonal and tidal variability in basic surface water parameters (e.g., temperature, salinity, dissolved oxygen [DO], turbidity, pH, and conductivity), and COPCs in surface water. Samples will also be collected for performing supplemental analyses to aid in identifying sources of COPCs to the Study Area.

These data will be used to refine the CSM, refine the list of COPCs, identify where additional sediment characterization data are needed to complete the characterization of the sediments, support hydraulic and sediment transport computer modeling, support the ERA, and support the FS.

2. Broadly characterize the hydraulic properties and flow dynamics of surface water within the Study Area. This objective will be achieved by performing monthly field surveys of water quality parameters for one year and by deploying current meters. These data will provide information on seasonal and tidal variability in basic surface water parameters (e.g., temperature, salinity, DO, turbidity, pH, and conductivity), and information on surface water flow, tidal influences on surface water flow, and the potential for sediment scour from propeller wash. This information will be used to refine the CSM, support hydraulic and sediment transport computer modeling, and support the FS.
3. Evaluate sediment depositional history and stability. This objective will be achieved using geochronology/radioisotope analyses of surface and subsurface sediments and by collecting geotechnical and other physical data (e.g., Sedflume data, and bathymetric, side-scan sonar, and magnetic surveys). These data will provide information on areas of deposition and erosion (in addition to rates of sediment deposition), will support identification of potential sources of COPCs to Study Area sediments, and will provide information to support the sediment transport model.
4. Collect the data needed to support a SLERA and a BERA Problem Formulation to define the scope of a BERA Field Sampling Program. The SLERA will, to a large extent, use existing data for the Study Area in order so that it is not dependent on the Phase 1 RI timeline. However, the Phase 1 RI Field Program will include several tasks directed towards supporting the SLERA and especially the BERA Problem Formulation, including a wildlife habitat survey (including a shoreline assessment), benthic community surveys, and fish community surveys. In addition, the sediment and surface water data will allow refinement of the CSM for the BERA Problem Formulation and BERA Field Sampling Program.
5. Evaluate baseline concentrations of specific airborne chemicals (volatile organic compounds [VOCs] and polychlorinated biphenyls [PCBs]), measure the level of ambient concentrations that would be experienced within the breathing zone on or along the Study Area, and the contributions, if any, that are potentially attributable to

the Study Area. These objectives will be achieved by performing simultaneous air measurements at selected stations on opposite sides of Newtown Creek and its tributaries as well as measurements at a height of about 2.5 feet above the water surface. These data will provide concentrations of volatile constituents and PCBs that may be present upwind (background), on, and downwind of the Study Area and will facilitate an upwind-downwind analysis to estimate the contribution, if any, from the Study Area to measured air concentrations both on the banks and over the water surface.

6. Perform reconnaissance to describe the physical nature of the shoreline and to support future evaluations of discharges to the Study Area. This objective will be achieved by obtaining aerial photography of the Study Area and performing a shoreline assessment. The data obtained from the aerial photography survey will provide information on the presence of pipes, seeps, and overland flow. This information will support refinement of the CSM and provide information to help confirm the presence of known discharges to the Study Area and potentially identify other discharges to the Study Area. The reconnaissance data will be combined with the information obtained from the review of data on loadings to the Study Area, and other available data (e.g., as-built drawings, historical maps, and figures) to aid in the preparation of the sources sampling approach.
7. Collect data to support the identification of sources of COPCs to the Study Area sediments and surface water. This objective will be achieved by analyzing sediment and surface water samples for a broad list of COPCs that are representative of potential sources of COPCs to the Study Area and by sampling select seeps, outfalls, overland flows, discharge pipes, and/or sediments in the areas of potentially significant surface water contributions or in other areas where sediment is visually impacted. It will also include sampling of groundwater using in-creek techniques and/or land-based monitoring wells as part of a weight-of-evidence approach to identify significant loadings of COPCs, and to the extent of the available information, sources of such loadings, to the Study Area (should an upland site ultimately require the installation of upland wells to fully characterize the upland contaminant loadings, this characterization will be the subject of the process outlined in RI/FS Work Plan (AECOM 2011) Section 3.2.4 and AOC Section XI, Paragraph 54.e and AOC Section XII, Paragraph 58.b). The information evaluated includes general chemistry data and

specific data collected for this purpose, referenced to in the RI/FS Work Plan (AECOM 2011) as supplemental data.

8. Make observations of existing recreational and industrial activities occurring in the Study Area. This objective will be achieved by observing and recording occurrences of these uses within the Study Area during the various Phase 1 RI field activities.
9. Perform historical research into available data on geology, hydrogeology, and potential upland sources to evaluate the impact to Study Area sediments and surface water through flux of groundwater containing COPCs. This objective will be achieved by obtaining available upland data from publicly available data sources (e.g., United States Geological Survey [USGS] publications) and from reports on site investigations for properties through which groundwater may potentially flow to the Study Area. After reasonable efforts are made to obtain information, the Respondents may need USEPA assistance to obtain some of these reports.
10. Collect data to support potential future FS alternatives evaluations. This objective will be achieved by collecting sediment samples and analyzing these samples for geotechnical parameters.

In summary, the Phase 1 RI Field Program will include the following activities:

- Bathymetric, side-scan sonar, and magnetic surveys
- Aerial photography survey
- Shoreline assessment
- Air monitoring
- Sediment sampling (surface sediments, subsurface sediments, and Sedflume testing)
- Surface water monitoring, sampling, and analysis
- Current meter deployments
- Supplemental analyses
- Groundwater sampling and analysis using in-creek techniques and/or land-based monitoring wells; should an upland site ultimately require the installation of upland wells to fully characterize the upland contaminant loadings, this characterization will be the subject of the process outlined in RI/FS Work Plan (AECOM 2011) Section 3.2.4 and AOC Section XI, Paragraph 54.e and AOC Section XII, Paragraph 58.b
- Ecological habitat survey and biological evaluation

Phase 1 RI Field Program activities proposed to meet these objectives are presented and discussed in Sections 4 through 12 of this FSAP. This groundwater sampling task will be scoped at approximately the midpoint of the Phase 1 RI Field Program in the Phase 1 RI Work Plan Addendum. This addendum will include the applicable FSAP procedures.
All sampling and data collection stations for the Phase 1 RI Field Program are provided in Figure 1-6. Phase 1 RI field activities will be conducted in accordance with this FSAP and with the QAPP (Anchor QEA 2011b), HASP (Anchor QEA 2011a), DMP (Anchor QEA 2011c), and applicable SOPs.

1.6 Health and Safety and Procedural Requirements

This section provides an overview of the health and safety requirements, SOPs, and equipment calibration and contamination requirements for the Phase 1 RI Field Program to ensure activities are conducted safely and adhere to specific standards and procedures.

1.6.1 Compliance with Health and Safety Requirements

All FSAP activities proposed for the Phase 1 RI Field Program will follow the procedures outlined in the site-specific HASP (Anchor QEA 2011a). The HASP was prepared in accordance with the Occupational Safety and Health Administration (OSHA) requirements contained in 29 Code of Federal Regulations (CFR) 1910 including the final rule contained in 29 CFR 1910.120.

All field team staff and subcontractor personnel must read and comply with the site-specific HASP (Anchor QEA 2011a), and sign an acknowledgement form contained in the HASP. Visitors and new staff will be given a safety briefing by the Anchor QEA Project On-site Safety Officer (POSO) to include a review of site environmental health and safety procedures required by the HASP and sign the corresponding acknowledgement form.

Field team staff will complete a Task Hazard Analysis (THA) form when new tasks or different investigative techniques are proposed that are not addressed in the HASP. The THAs will be reviewed and approved by the POSO, and completed forms will be reviewed with all field team staff performing the specific task prior to implementation.

The field team staff will be trained as specified in the HASP (Anchor QEA 2011a).

The implementation of health and safety for the RI/FS will be the shared responsibility of the Anchor QEA Project Manager, Anchor QEA RI Manager, the Anchor QEA Safety Manager, the Anchor QEA POSO, Anchor QEA field team staff implementing the FSAP, as well as Anchor QEA subcontractors. All field team staff, subcontractors, and site visitors have the authority to STOP WORK if they see a potential or actual hazard that may threaten the safety of people or the environment. Upon stopping work, the designated Anchor QEA POSO must be immediately notified and provided with information regarding the nature of the safety, health, or environmental concern. Once the potential or actual hazard has been eliminated, work can proceed. See Section 1 of the HASP (Anchor QEA 2011a) for further details.

1.6.2 Standard Operating Procedures

SOPs have been developed for the RI/FS to ensure consistency and quality in the implementation of the field work. The activities that comprise the Phase 1 RI Field Program and their associated procedures are presented in Sections 4 through 12 of this FSAP. Detailed project specific SOPs to complete specified tasks are referenced in these sections, summarized in the list below, and provided in Attachment 1:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-03 – Conductivity, Temperature, Depth/Turbidity Data Collection and Water Sampling
- NC-04 – Navigation and Boat Positioning
- NC-05 – Sediment Grab Sampling
- NC-06 – Subsurface Coring
- NC-07 – Calibration and Operation of a Portable Hydrogen Sulfide Monitor
- NC-08 – Sediment Core Processing
- NC-09 – Geochronology Core Processing
- NC-10 – Sedflume Testing
- NC-11 – Water Column Profiling and Sampling
- NC-12 – Current Meter Deployment and Data Collection

- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation
- NC-17 – Multi-Parameter Water Quality Data Collection
- NC-18 – Fish Community Survey
- NC-19 – Acoustic Doppler Current Profiler (ADCP)
- NC-20 – Air Monitoring for Polychlorinated Biphenyls
- NC-21 – Air Monitoring for Volatile Organic Compounds
- NC-22 – Benthic Community Survey
- NC-23 – Shoreline Habitat Survey
- NC-24 – Land-Side Habitat Survey

SOPs NC-12 and NC-19 will be submitted at a later date, after the selection of subconsultants responsible for those activities. SOPs NC-20 and NC-21 will be submitted to USEPA for review prior to the initiation of the sampling event.

1.6.3 Maintenance, Calibration and Decontamination of Instruments

Field instruments used for field measurements, e.g., multi-parameter sonde water quality meter and photoionization detector (PID), will be maintained and calibrated according to the manufacturer's specifications and applicable SOPs (see also QAPP Worksheet #22 regarding field equipment calibration [including acceptance criteria], maintenance, testing, and inspection). If post-sampling calibration data are not within an acceptable range, data for the period of use will be qualified as not reportable. Instruction manuals for all field instruments will be available in the field facility and where the instruments are being used. Instruments will be stored in the field facility in a temperature-controlled climate. Instruments will be inspected daily for possible problems (e.g., cracked or clogged lines or tubing, weak batteries). Instruments will be calibrated at the beginning of each field day and as needed thereafter where readings are suspect to produce accurate and reproducible data.

All field equipment or instruments coming in contact with potentially contaminated media or used for sample collection and/or sample processing will be decontaminated before and after use and between stations in accordance with NC-02 – Equipment Decontamination.

1.7 Modifications to the Phase 1 RI Field Program

It is anticipated that during the Phase 1 RI Field Program there will be modifications to the sampling identified in the RI/FS Work Plan (AECOM 2011) and the FSAP. These changes may include moving a sample station due to obstruction, utility, or refusal or the addition of a sample station or sample. Additionally, there may be other changes to the RI/FS Work Plan and FSAP due to unanticipated events, e.g., broken sample bottles. These changes will be handled as described below (see also Figure 1-7):

- For minor changes in sample location (e.g., moving a location a reasonably short distance, adjusting core location due to refusal, adjusting vertical interval, collecting opportunistic sample) that are anticipated by the Work Plan (AECOM 2011) and this FSAP, the change will be considered an allowable field decision and will be reported to USEPA on Field Change Reports and in routine status reports (weekly field status reports and monthly status reports). These are modifications that do not impact scope of study design objectives. An example Field Change Report is provided in NC-01 – Field Records.
- For changes that require a deviation from the RI/FS Work Plan, but that do not change the study design objectives, decrease sampling or analysis or data quality or move a location beyond a short distance (e.g., additional surface water sample, additional core location, additional vertical interval or are caused by significant weather delays) will be approved by a core group of the Respondents identified to make these decisions. Unplanned changes that require a deviation from the RI/FS Work Plan will also be documented on the Field Change Form. The change will be submitted to USEPA on a Field Change Form and will be reported to USEPA on Field Change Reports and in routine status reports (weekly field status reports and monthly status reports). An example Field Change Report is provided in NC-01 – Field Records.
- For changes that require an RI/FS Work Plan amendment or that change the RI/FS study design objectives, change direction of an end point, or require upland or groundwater work (in-creek or upland), the change will be approved by the Respondents Steering Committee. The change will be submitted to USEPA on a Field Change Report and will be reported to USEPA on Field Change Reports and in

routine status reports (weekly field status reports and monthly status reports).

- If, during the course of the Phase 1 RI Field Program, USEPA requests the addition of a sample station or sample, USEPA will submit this request to the Respondents in writing. This request will be reviewed by the Respondents for approval prior to complying with the request.

1.8 Amendments for Future Phase of Investigation

As described in Section 1.7 all amendments to the RI/FS Work Plan, FSAP or the QAPP that occur during the Phase 1 RI Field Program will be submitted to USEPA in advance for approval. The FSAP and QAPP will also be modified for future phases of investigation, when necessary, by submittal of amendments documenting all necessary changes to the QAPP and FSAP to USEPA for review and approval.

Table 1-1
Sampling Summary

Matrix	Type of Sample/Test	Locations	Sampling Intervals per Location	Sampling Events	Total Field Samples	Number of Different Chemical/Physical Analyses[a] For all Samples	For 25% of Samples	For 10% of Samples	For Select Samples	Total Number of Non-QA/QC Analytical Tests	QA/QC Analytical Tests[b]	Total Analytical Tests
Ambient Air	Analytical	**29**	1	1	29	2	--	--	--	58	4	62
Surface Sediment	Analytical - Low DO Event[d]	127	1	1	127	20	8	--	1[c]	2,811	293	3,104
	Analytical - High DO Event[d]	34	1	1	34	6	--	--	--	204	24	228
	Ecological Macroinvertebrate[d]	34	3 discrete grabs per location	2	204	--	--	--	--	--	--	--
Core Sediment	Analytical	95	8	1	760	19	5	4	2[c]	15,932	1,589	17,521
Surface Water	Ecological	34	1	2	68	6	--	--	--	408	42	450
	Analytical	15	2	12	360	25	1	--	--	9,090	909	9,999
	Current Meter	5	3	6[e]	90	1	--	--	--	90	N/A	90
Totals					**1,672**					**28,593**	**2,861**	**31,454**

Notes:
This table shows the sample matrices, number of sample locations per matrix, number of sample intervals and sampling events per location, number of field and quality control samples, and number of analyses per sample. For the purpose of this overview table, the number of analytical samples is calculated by multiplying the number of field samples by the number of analyses (not including archives) and adding the quality control samples (as five percent of that total number).

Groundwater samples are not included in this table; sampling locations will be determined as described in Section 4 of the Work Plan.

DO – Dissolved Oxygen
QA/QC – Quality Assurance/Quality Control
-- Not applicable
a - Analysis number does not include calculations (ex. Hardness)
b - Applies to samples for analytical testing only and includes field duplicates, MS and/or MSD and/or LD if applicable; supplemental data analyses sample count for each matrix not included in estimate. Equipment rinsate blanks or field blanks at a frequency of 1 per 20 or 1 per day whichever is least frequent are not included in the QA/QC Analytical Test counts.
c - Geochronology at 17 locations (in core locations at 7 intervals).
d - Locations co-located with surface sediment samples, however, locations represent a different sampling type and are included separately in the count of total locations. During the high DO benthic macroinvertebrate sampling event, sediment samples will be collected for chemical analysis. During the low DO benthic macroinvertebrate sampling event, sediment samples will be collected for select analyses; samples will be archived for potential additional analyses.
e - Sampling Events for 3 month deployment, two measurements sets (flood tide, midpoint of ebb tide) per sampling event. If current meter deployment is extended to 1 year, sampling events increases to 24.

Figure 1-1
Location Map
Field Sampling and Analysis Plan
Newtown Creek RI/FS

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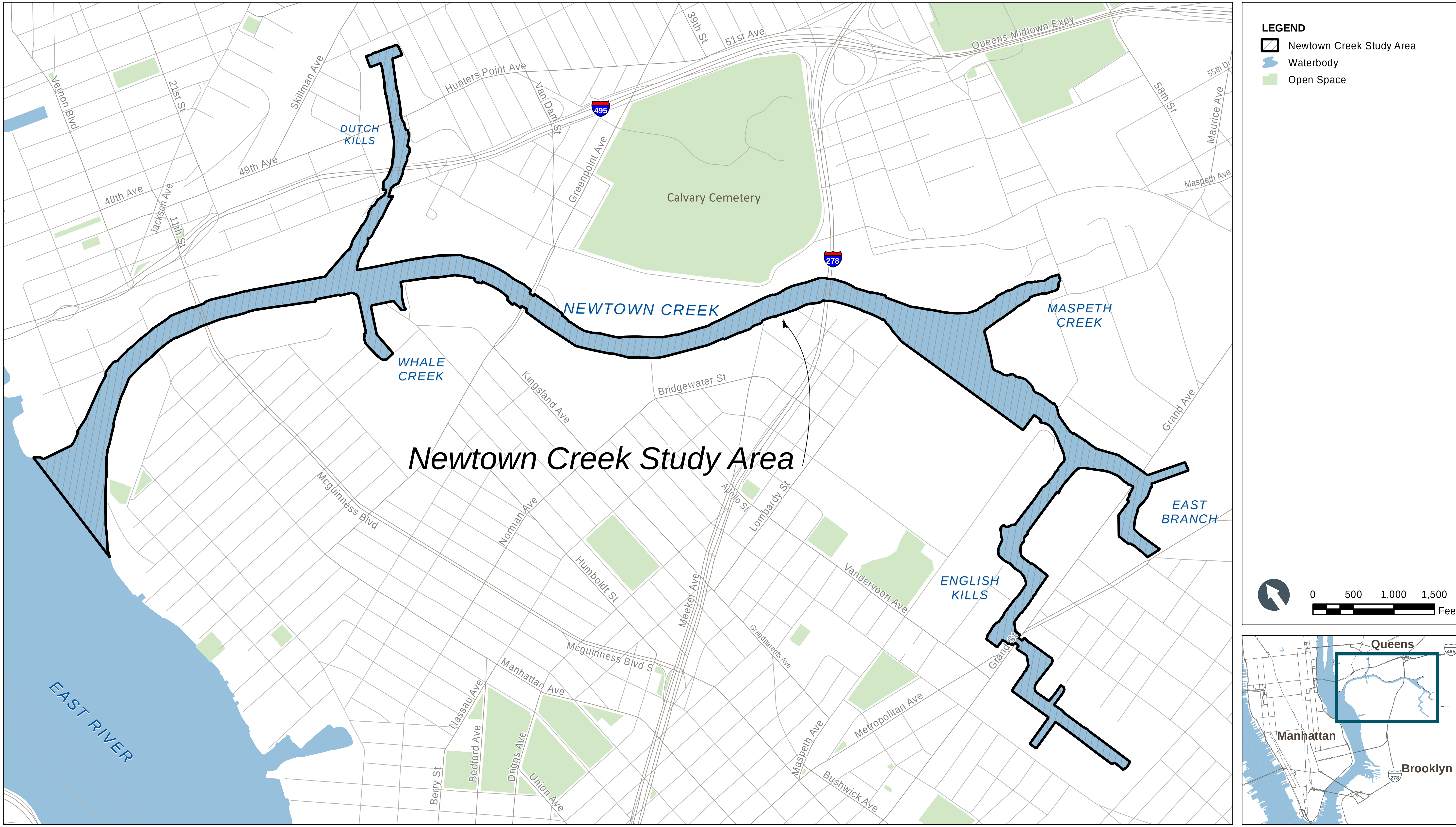

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 1-2 Study Area Location.mxd lnudson 10/14/2011 3:07:01 PM

ANCHOR QEA

Figure 1-2
Study Area Location
Field Sampling and Analysis Plan
Newtown Creek RI/FS

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 1-3 Generalized Zoning Map.mxd lhudson 10/14/2011 3:08:49 PM

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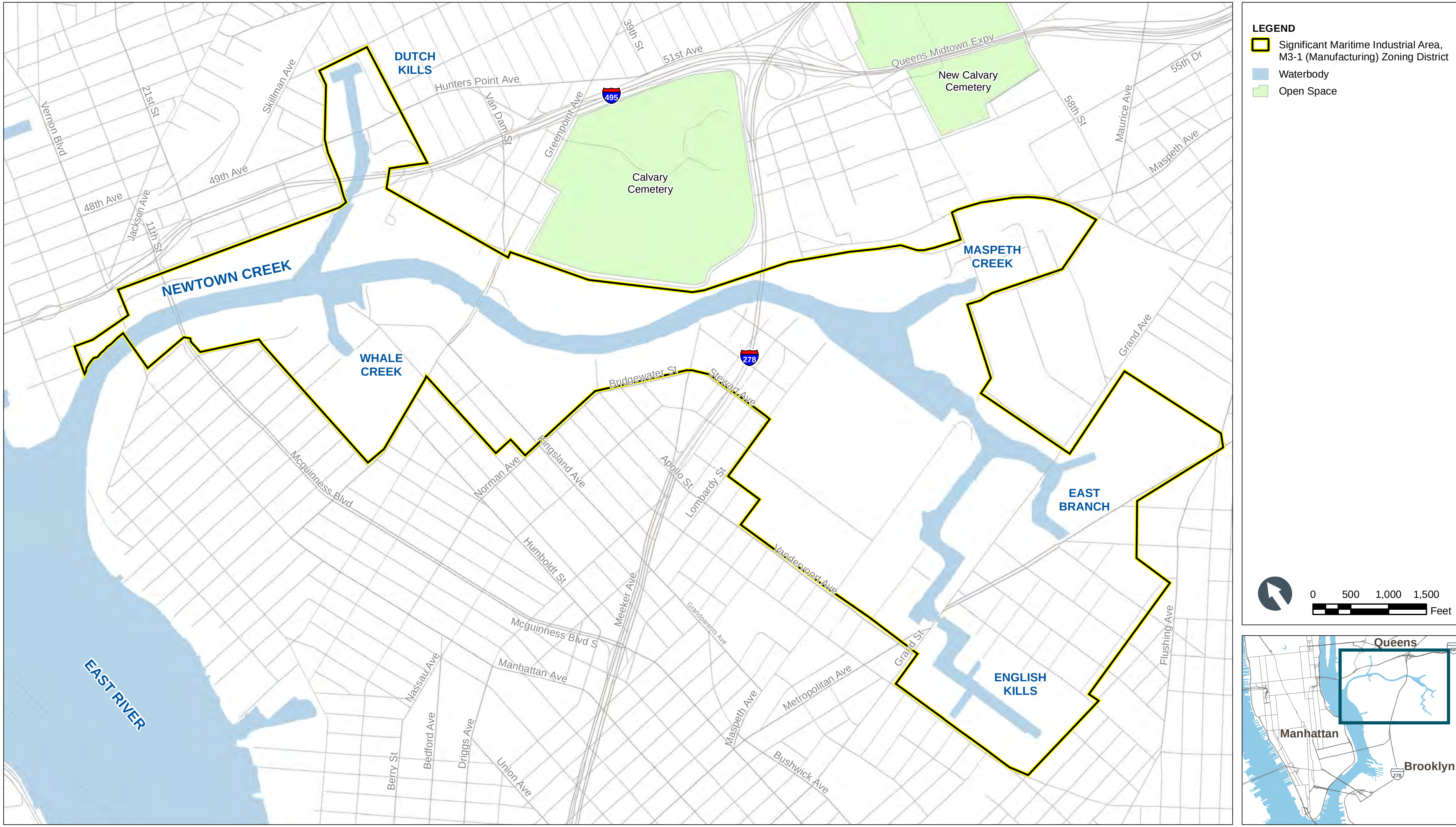
Figure 1-3
Generalized Zoning Map
Field Sampling and Analysis Plan
Newtown Creek RI/FS



ANCHOR QEA

Figure 1-4
Significant Maritime Industrial Area Map
Data Collection Plan
Newtown Creek RI/FS

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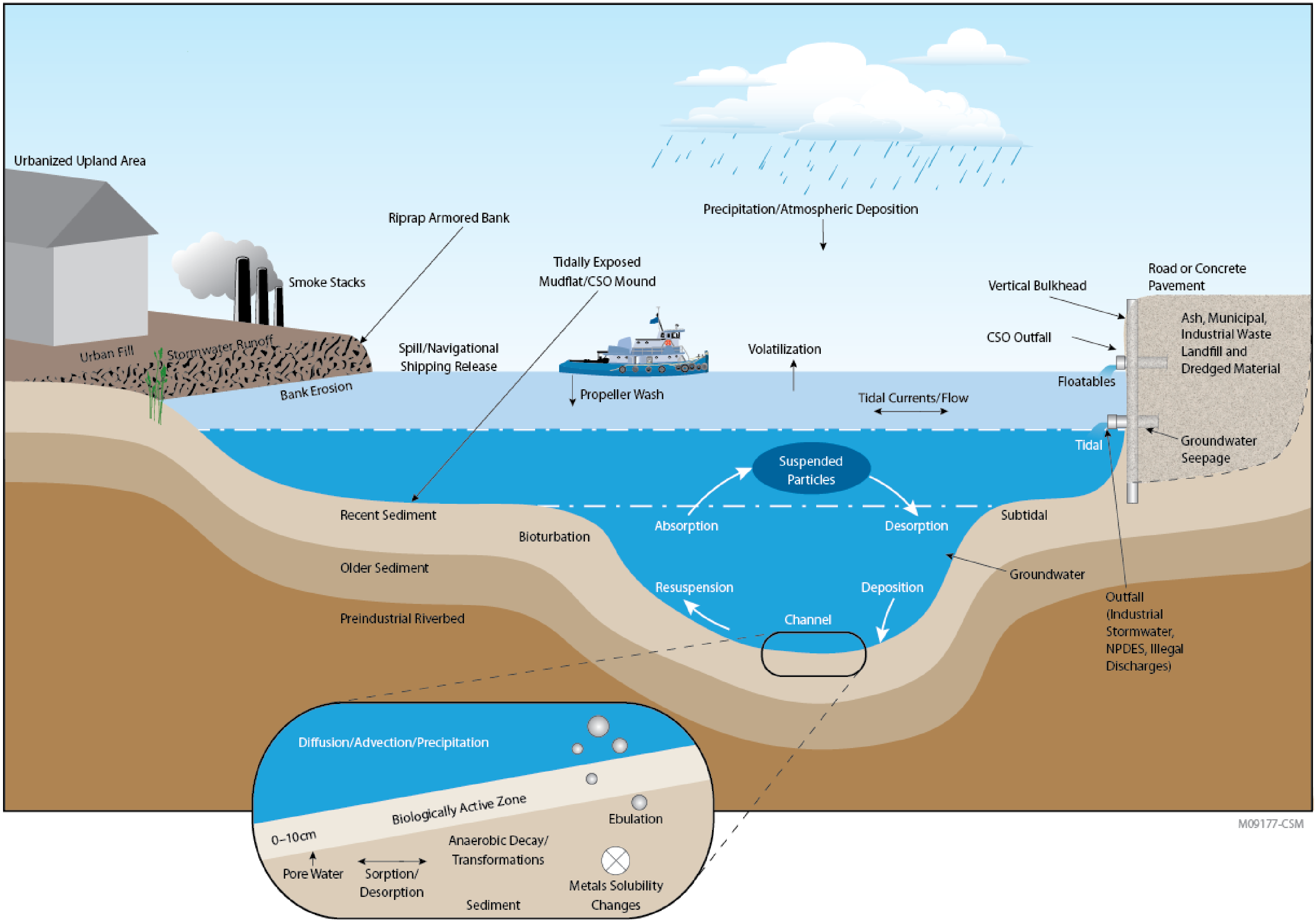

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Figure 1-5
Preliminary Physical Conceptual Site Model
Field Sampling and Analysis Plan
RI/FS Newtown Creek

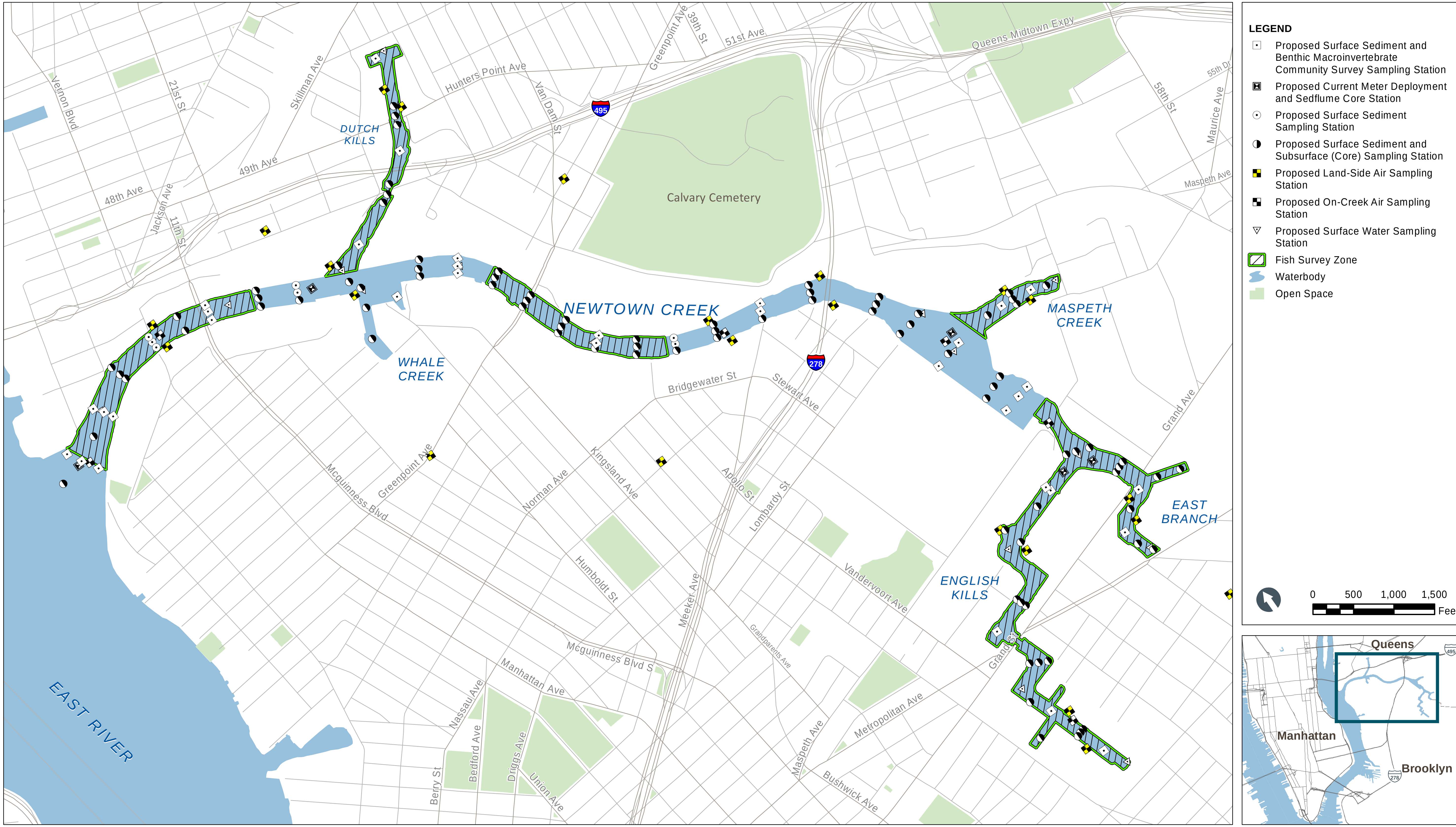

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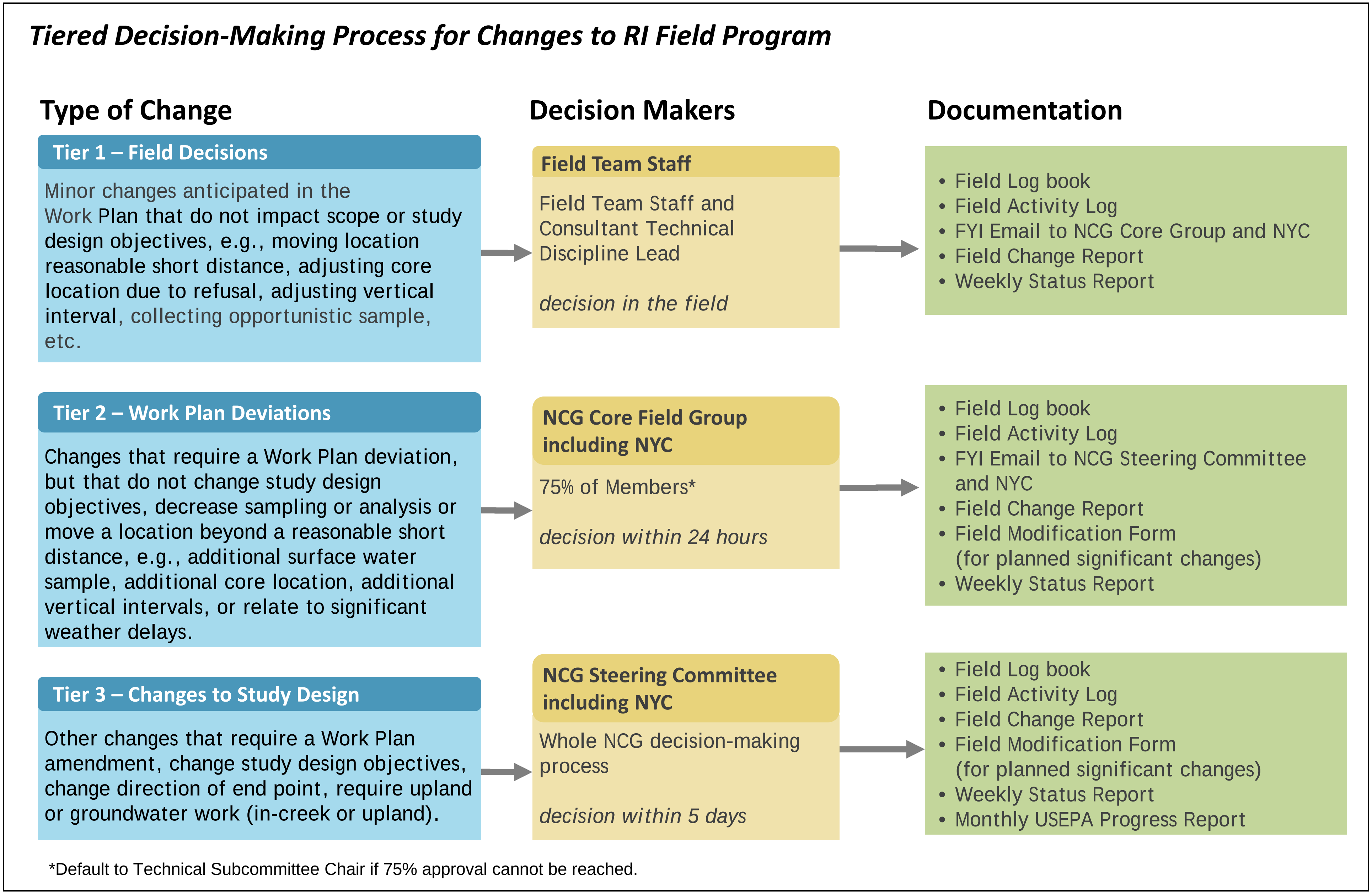
Figure 1-6
Summary of Proposed Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 1-6 Summary of Proposed Sampling Stations.mxd lhudson 10/14/2011 3:12:59 PM



ANCHOR QEA

Figure 1-7
Flow Chart of Field Decisions

2 ORGANIZATION AND RESPONSIBILITIES

An organizational framework and management control system capable of executing the work of the RI/FS will incorporate an integrated structure where each member understands his or her function and his or her relationship to the overall project. Lines of communication will be maintained among project personnel and the RI and FS Managers. Communication will also be maintained regularly between the Project Manager, the RI and FS Managers, the Respondents, and the USEPA.

While each individual involved in the RI/FS and in the generation of data is implicitly part of the overall RI/FS and QA program, certain individuals have specifically designated responsibilities. The Respondents will act as the lead for the RI/FS. Investigation support will be provided to the Respondents by Anchor QEA. The individuals with specifically designated responsibilities for the RI/FS are described below.

Figure 2-1 presents an organizational chart depicting the hierarchy of roles and responsibilities for the RI/FS. These roles and responsibilities are defined below. Table 2-1 shows the personnel assigned to each of these roles

2.1 USEPA Remedial Project Manager

The USEPA Remedial Project Manager (RPM) is responsible for the overall management of the RI/FS.

2.2 Respondents Technical Lead(s)

"Respondents" is defined as those signatories to AOC identified in Appendix C of the AOC, as may be amended from time to time. Each Respondent will have a Technical Lead who is responsible for the review and approval of RI/FS work plans and reports.

2.3 Anchor QEA Project and Task Management

Anchor QEA individuals with specifically designated project and task management responsibilities for implementation of the RI/FS Field Programs include the RI/FS Project Manager, the RI Manager, the FS Manager, the Risk Assessment Managers, the Safety

Manager, and Project QA Coordinator. Various personnel (including the Project Chemist and Data Validation Coordinator) will be responsible for the sample tracking and validation. Field data management activities will be coordinated by a Data Management Task Manager. Roles and responsibilities of these individuals are presented below.

2.3.1 RI/FS Project Manager

The Project Manager has the overall responsibility for the implementation and completion of each of the tasks identified in the RI/FS Work Plan. The RI/FS Project Manager will manage administrative aspects of the project, including delivery of progress letters and communication regarding project schedule. The RI/FS Project Manager will also support the RI/FS Technical Lead in developing technical aspects of the project. The RI/FS Project Manager will function as Anchor QEA's principal contact with the Respondents and with USEPA.

2.3.2 RI/FS Technical Lead

The RI/FS Technical Lead will work with the Respondent Technical Leads to communicate project approach with USEPA. The RI/FS Technical Lead will be responsible for leading technical aspects of the project, including the development, review, and approval of RI/FS work plans and reports, and will be a principal contact with the Respondents and USEPA.

2.3.3 RI Manager

The RI Manager is responsible for scoping and implementing the RI. He is also responsible for preparing the RI reports. The RI Manager will keep the Project Manager apprised of the status of the RI Program, as well as communicate any issues affecting the schedule, budget, or achievement of the task objectives.

2.3.4 Safety Manager

The Anchor QEA Safety Manager is the individual responsible for the preparation, interpretation, and modification of the project-specific HASP (Anchor QEA 2011a). The Safety Manager advises the Project Manager, RI Manager, and POSO on matters relating to health and safety, recommends appropriate personal protective equipment (PPE) and safety equipment, and maintains regular contact with the Project Manager, RI Manager, and POSO to evaluate Study Area conditions and new information that might require modifications to the HASP (Anchor QEA 2011a).

2.3.5 FS Manger

The FS Manager will have responsibility for the preparation of the FS, and will also participate in the RI scoping process to ensure that the collected data will be useful in screening and implementation of remedial alternatives.

2.3.6 Risk Assessment Task Managers

The risk assessment managers are responsible for activities related to the human health and ecological risk assessments. They will assist the RI manager in design of the RI to collect data to support these risk assessments. They will also prepare the human health and ecological risk assessment-related documents (e.g., work plans, PAR-HHRA, HHRA, SLERA, and BERA).

2.3.7 Project Quality Assurance Coordinator

The Project QA Coordinator will review project plans and revisions to the plans to maintain proper QA throughout the investigation. In addition, the Project QA Coordinator will be responsible for performance and system audits, data processing QC, data quality review, monitoring the effectiveness of corrective actions, and coordinating the QA/QC efforts between Anchor QEA and subcontractors, including analytical laboratories.

2.3.8 Project Chemist

The Project Chemist will serve as the analytical laboratory coordinator and be the primary point of contact with the laboratories. The Project Chemist will be responsible for laboratory procurement and monitoring of progress.

2.3.9 Chemistry Technical Resource

The Chemistry Technical Resource will be responsible for working with other project team members to identify the most appropriate sampling and analysis methods to achieve the RI/FS data usability objectives.

2.3.10 Data Validation Coordinator

The Data Validation Coordinator will be responsible for managing the validation task, including ensuring that validation is conducted and documented according to the requirements of the QAPP (Anchor QEA 2011b), and interacting with the laboratories to resolve any issues.

2.3.11 Data Management Task Manager

The Data Management Task Manager is responsible for data management for the RI/FS, including overall responsibility for database quality and structure, including graphical representation of data for completion of the RI, CSM, and FS.

2.3.12 Historical Data Review Task Manager

The Historical Data Review Tasks Manager is responsible for overseeing the collection and management of historical data to support RI/FS objectives. The Historical Data Review will be conducted in accordance with the Data Collection Plan (Anchor QEA 2011e) and the DMP (Anchor QEA 2011c).

2.4 Anchor QEA Field Management

The Phase 1 RI Field Program will be implemented by a Field Team including a Field Team Leader, POSO, Field Manager, and Field Office Coordinator. These key project personnel will be supported by technical personnel during implementation of RI/FS Field Programs.

2.4.1 Field Team Leader

The Field Team Leader is responsible for supervision of the field team staff and for field documentation of proper sample collection protocols, sample collection, equipment decontamination, and chain-of-custody (COC) documentation. The Field Team Leader is also responsible for the initialization and accurate verification of field notebooks, COC records, sample labels, and other field-related documentation.

2.4.2 Project On-Site Safety Officer

The POSO will be appointed by the Project Manager. The POSO will be present in the Study Area or at the field facility during all activities covered by the HASP (Anchor QEA 2011a). The POSO is responsible for enforcing the requirements of the HASP once work begins and for ensuring that all personnel, including subcontractors, adhere to the HASP.

2.4.3 Field Manager

The Field Manager oversees the RI field activities and supervises the Field Team Leader. The Field Manager is responsible for ensuring that the field sampling activities are implemented in accordance with the approved plans (FSAP, QAPP [Anchor QEA 2011b], HASP [Anchor QEA 2011a], and DMP [Anchor QEA 2011c]) and pertinent SOPs.

2.4.4 Field Office Coordinator

The Field Office Coordinator is responsible for establishing and maintaining the field facility office and sample processing area. The Field Office Coordinator will assist the Field Team Leader in the management and transfer of field data.

2.4.5 Field Team Staff

Field implementation of this RI will be conducted by experienced geologists, chemists, engineers, and/or environmental technicians. Their responsibilities will include the documentation of proper sample collection protocols, sample collection, equipment decontamination, and COC documentation.

2.5 Subcontractors

Subcontractors will be procured to support the Phase 1 RI Field Program activities in the field and to analyze samples collected in the field. This section describes the subcontractors identified for the Phase 1 RI.

2.5.1 Field Subcontractors

In order to complete the field activities described in this FSAP, Anchor QEA will procure qualified, health and safety-focused subcontractors to facilitate various field tasks (see Section 3.2). Field service contactors will be contracted to support and/or perform the following activities:

- Aerial photography (perform)
- Bathymetry, side-scan sonar, and magnetic survey (perform)
- Shoreline survey (support with boats)
- Land-based survey (perform)
- Sediment grab sampling (support with boats and equipment)
- Sediment coring (support with boats and equipment)
- Surface water sampling (support with boats)
- Tidal survey (support with boats)
- Ecological sampling (support with boats)
- Current meter deployment and monitoring (support with boats and equipment)
- Sedflume testing (support with boats and equipment)
- Groundwater sampling using in-creek techniques and/or land based monitoring wells (support with boats and equipment)

2.5.1.1 Subcontractor Laboratory Project Manager

The Laboratory Project Manager acts as the primary point of contact at the analytical laboratory with whom the Anchor QEA Project Chemist will communicate to resolve sampling, receipt, analysis, and storage issues. There will be multiple laboratories analyzing samples during the RI/FS; each laboratory will have a Laboratory Project Manager. The Laboratory Project Managers are identified in the QAPP (Anchor QEA 2011b).

2.5.1.2 Laboratory Quality Assurance Officer

The Laboratory QA Officer (QAO) will be responsible for laboratory QA/QC activities associated with the project. The specific duties of the Laboratory QAO include determining whether analyses are conducted within the appropriate holding times and that laboratory custody procedures are followed. Moreover, the Laboratory QAO monitors daily precision and accuracy records, maintains detailed copies of all procedures, reschedules analyses based upon unacceptable data accuracy or precision, and identifies and implements corrective actions necessary to maintain QA standards. The Laboratory QAO or a designee will conduct initial validations and assessments of analytical data results and report the findings directly to the Project QA Coordinator. Each laboratory will have a Laboratory QAO.

2.5.1.3 Laboratory Sample Custodian

The Laboratory Sample Custodian's responsibilities include verifying proper sample entry and sample handling procedures by laboratory personnel. The Laboratory Sample Custodians will be identified by each laboratory for this project.

Table 2-1
Remedial Investigation Personnel

Title	Organization	Name	E-mail	Telephone
USEPA				
Co-Remedial Project Manager	USEPA Region 2	Caroline Kwan	Kwan.Caroline@epamail.epa.gov	(212) 637-4275
Co-Remedial Project Manager	USEPA Region 2	Nica Klaber	Klaber.Nica@epa.gov	(212) 637-4309
Respondents				
Technical Lead	Phelps Dodge Refining Corporation	Ron Buchanan	Ronald_Buchanan@FMI.com	602-366-8301
Technical Lead	National Grid	Tracey Bell	Tracey.Bell@us.ngrid.com	917-886-9207
Technical Lead	National Grid	Thomas Campbell	Thomas.Campbell@us.ngrid.com	516-545-2555
Technical Lead	Exxon Mobil	Steve Schmidt	steven.p.schmidt@exxonmobil.com	703-846-1005
Technical Lead	Texaco	Gesele Harris	gmcq@chevron.com	770-984-4190
Technical Lead	BP	John Frankenthal	John.Frankenthal@bp.com	630-836-7123
Technical Lead	New York City Department of Environmental Protection	Angela Licata	alicata@dep.nyc.gov	718-595-4398
Technical Lead	New York City Department of Environmental Protection	Eileen Mahoney	EMahoney@dep.nyc.gov	718-595-4433
Anchor QEA Project and Task Management				
Project Manager	Anchor QEA, LLC	Jim Quadrini	jquadirini@anchorqea.com	201-571-0912
Technical Lead	Anchor QEA, LLC	Tom Schadt	tschadt@anchorqea.com	206-903-9306
RI Manager/Field Manager	Anchor QEA, LLC	James Keithly	jkeithly@anchorqea.com	206-903-3340
FS Manager	Anchor QEA, LLC	Paul LaRosa	plarosa@anchorqea.com	978-974-9090
Safety Manager	Anchor QEA, LLC	Chris Torell	ctorell@anchorqea.com	617-371-4461
Project QA Coordinator	Anchor QEA, LLC	Leslie McKee	lmckee@anchorqea.com	360-733-4311
Project Chemist	Anchor QEA, LLC	Joy Dunay	jdunay@anchorqea.com	206-903-3320
Chemistry Technical Resource	Anchor QEA, LLC	Beth Lamoureux	blamoureux@anchorqea.com	201-571-0916
Data Management Task Manager	Anchor QEA, LLC	Mark Meyers	mmeyers@anchorqea.com	201-571-0926

Table 2-1
Remedial Investigation Personnel

Title	Organization	Name	E-mail	Telephone
Project Chemist - Data Validation Coordinator	Anchor QEA, LLC	Delaney Peterson	dpeterson@anchorqea.com	206-903-3396
Risk Assessment Manager	Anchor QEA, LLC	David Glaser	dglaser@anchorqea.com	201-930-9890
Ecological Risk Assessment (ERA) Task Manager	Anchor QEA, LLC	Linda Logan	llogan@anchorqea.com	267-756-7165
Human Health Risk Assessment Task Manager	Anchor QEA, LLC	Taku Fuji	tfuji@anchorqea.com	503-670-1108 ext. 24
Field Office Coordinator	Anchor QEA, LLC	Karen Yanasak	kyanasak@anchorqea.com	206-903-3389
Project On-site Safety Officer (POSO)	Anchor QEA, LLC	TBD		
Anchor QEA Field Management				
Field Team Leader	Anchor QEA, LLC	David Gillingham	dgillingham@anchorqea.com	206-903-3353
Field Team Leader	Anchor QEA, LLC	Amy Corp	acorp@anchorqea.com	360-715-2704
Field Team Leader	Anchor QEA, LLC	Calvin Douglas	cdouglas@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Joy Dunay	jdunay@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Adam Gale	agale@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Ben Howard	bhoward@anchorqea.com	360-715-2704
Field Team Leader	Anchor QEA, LLC	Jason Kase	jkase@anchorqea.com	850-912-8400
Field Team Leader	Anchor QEA, LLC	Mark LaRue	mlarue@anchorqea.com	315-453-9009
Field Team Leader	Anchor QEA, LLC	Margaret Murphy	mmurphy@anchorqea.com	315-453-9009
Field Team Leader	Anchor QEA, LLC	Chris Pelrah	cpelrah@anchorqea.com	315-453-9009
Field Team Leader	Anchor QEA, LLC	Delaney Peterson	dpeterson@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Joe Pursley	jpursley@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Jim Ryan	jryan@anchorqea.com	315-453-9009
Field Team Leader	Anchor QEA, LLC	Jim Shannon	jshannon@anchorqea.com	206-287-9130
Field Team Leader	Anchor QEA, LLC	Charlie Szablewski	cszablewski@anchorqea.com	518-792-3709
Field Team Leader	Anchor QEA, LLC	Joe Volosin	jvolosin@anchorqea.com	716-667-1425
Field Team Leader	Anchor QEA, LLC	Chris Yates	cyates@anchorqea.com	518-792-3709

Table 2-1
Remedial Investigation Personnel

Title	Organization	Name	E-mail	Telephone
Subcontractors				
Laboratory Manager	Alpha Analytical	Cindy McQueen	cmcqueen@alphalab.com	508-844-4120
Laboratory Project Manager	TestAmerica – Pittsburgh	Carrie Gamber	Carrie.Gamber@testamericainc.com	412-963-2428
Laboratory Project Manager	TestAmerica – Sacramento	Robert Weidenfeld	Robert,Weidenfeld@testamericainc.com	865-291-3000
Laboratory Project Manager	Mass Spec Services	Hewitt Jeter	HewittJeter@aol.com	
Laboratory Project Manager	SGS North America	Amy Boehm	Amy.Boehm@sgs.com	910-350-1903
Laboratory Project Manager	Brooks Rand Laboratory	Amanda Royal	Amanda@brooksrand.com	206-632-6206
Laboratory Project Manager	GeoTesting Express	Mark Dobday	mdobday@geotesting.com	978-635-0424
Laboratory Project Manager	Watershed Assessment Associates, LLC	J. Kelly Nolan	jkn@rwaa.us	518-346-0225
Laboratory Project Manager	EnviroTest Laboratory	Ronald Bayer		845-562-0890

USEPA Remedial Project Manager — **NYSDEC**

Respondents Technical Leads

RI/FS FIELD PROGRAM ORGANIZATION

Project and Task Management

RI/FS Project Manager
Jim Quadrini, P.E., BCEE

RI/FS Technical Lead
Tom Schadt

RI Manager
James Keithly

Safety Manager
Chris Torell, P.G.

FS Manager
Paul LaRosa, P.E.

Risk Assessment Task Managers
David Glaser, Ph.D.
Linda Logan, Ph.D. (ERA)
Taku Fuji, Ph.D. (HHRA)

Project QA Coordinator
Leslie McKee

Project Chemist
Joy Dunay

Chemistry Technical Resource
Beth Lamoureaux

Data Validation Coordinator
Delaney Peterson

Data Management Task Manager
Mark Meyers, Ph.D.

Historical Data Review Task Manager
Keith Pine, R.G.

Field Management

POSO
Chris Torell, P.G.

Field Manager
James Keithly

Field Office Coordinator
Karen Yanasak

Field Team Leaders

David Gillingham
Adam Gale
Margaret Murphy, Ph.D.
Jim Ryan
Chris Yates
Amy Corp
Ben Howard
Chris Pelrah
Jim Shannon
Calvin Douglas
Jason Kase
Delaney Peterson
Charlie Szablewski
Joy Dunay
Mark LaRue
Joe Pursley
Joe Vosolin

Field Staff
Various

Subcontractors

Field and Laboratory Subcontractors

3 MOBILIZATION ACTIVITIES

The following activities will be performed to mobilize for the Phase 1 Field Program:

- Establishment of field facility
- Procurement of subcontractors, materials, and equipment
- Procurements of permits
- Identification of potential utility or other hazards within Study Area
- Surveying of control points for hydrographic and aerial surveys
- Establishment of staff gauges at control points

3.1 Establishment of Field Facility

Prior to the initiation of RI/FS Field Programs, a field facility will be established at a location with water access to the Study Area. This water access will include access to the water with either a dock, ladder or stairs where personnel can embark and disembark boats to be used for surveys and sampling, load and unload equipment, load sample containers, and unload samples.

The field facility will include an office with electricity, air conditioning, heat, telephone, and computer cable access. In addition to the office, the field facility will include an area appropriate for processing samples and a separate trailer or other similar area for secure storage of supplies (e.g., core liners, sample containers, and field measurement instruments). The Phase 1 RI Field Program includes the archiving of sediment samples for future chemical analysis. The field facility may have a freezer of adequate size to archive the Phase 1 RI Field Program samples. Alternatively, arrangements may be made at a secure off-site location for archiving samples.

During the Phase 1 RI Field Program, IDW, including portions of sediment samples not submitted for analysis, decontamination fluids, and PPE will be generated. This IDW will be containerized in *properly labeled* 55-gallon Department of Transportation (DOT) approved drums prior to disposal at an appropriate waste disposal facility (see SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal). The field facility will include a secure space for temporary storage of these drums.

3.2 Procurement of Subcontractors, Materials, and Equipment

Implementation of the Phase 1 RI Field Program will require the procurement of subcontractors. As described in Section 1.6, each subcontractor, will possess the training required by the HASP (Anchor QEA 2011a) including the environmental training (e.g., HAZWOPER).

Subcontractors required for the field program include:

- Marine utility locator
- Laboratories
- Boat operators
- Subsurface sediment core collection
- Hydrographic surveyor
- Aerial surveyor
- Land-based surveyor
- Current meter installation and equipment servicing and maintenance
- Sedflume sample collector and Sedflume laboratory for analysis
- IDW transport and disposal

All subcontractors will have experience with performing the specified work and have current licenses, where appropriate.

The marine utility locator subcontractor will be required to perform a survey of the underwater utilities in the Study Area. The subcontractor selected to perform this work must meet the following qualifications:

- Demonstrate experience in locating utilities and other obstructions in urbanized waterways
- Have equipment necessary to identify any potential underwater utilities or obstructions
- Have captains and crew with proper training/licensing (e.g., U.S. Coast Guard [USCG] licensing and OSHA certification)
- Be capable of providing reports of surveys, processed data, and tables identifying and explaining utilities and obstructions.

Laboratory subcontractors will be required to perform chemical and physical analyses of media samples collected during the Phase 1 RI Field Program. The laboratories selected to analyze these samples must meet the following qualifications:

- Possess current certification from the National Environmental Laboratory Accreditation Program (NELAP) for the parameter/method/matrix combinations
- Possess current certification in the state in which the laboratory is located (New York State Department of Health [NYSDOH] certification is preferred, but not required)
- Demonstrate experience with complex matrices in urban waterway environments
- Adhere to the QC procedures, detection and reporting limits, and control limits in the QAPP (Anchor QEA 2011b) and the published methods referenced in the QAPP
- Have the capacity to meet reasonable turnaround times for providing results based on industry standards and RI/FS requirements
- Be capable of providing an Electronic Data Deliverable (EDD) in Earthsoft's Environmental Quality Information System (EQuIS) four-file forma modification for incorporation into Anchor QEA's database
- Have in place a structured and documented management system describing the policies, objectives, principles, and organizational authority and responsibilities that ensure quality work and must meet the requirements of the national consensus standard, ANSI/ASQC E4-1994 (ANSI/ASQC 1994), Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs and NELAP; this includes an independent QA program that reports directly to the laboratory senior management and incorporates a closed-loop corrective action system

Boat subcontractors will be required to implement the field activities during the Phase 1 RI Field Program. The boat subcontractors selected to perform this work must meet the following qualifications:

- Demonstrate experience working in highly urbanized waterways and in varying water depths
- Have boats, crew, and equipment to be used for surface sediment, sediment core, and surface water sampling; tidal surveys; ecological sampling and surveys; and current

meter deployment as necessary to complete the work identified in the RI/FS Work Plan

- Have captains and crew with proper training/licensing (e.g., USCG licensing and OSHA certification)
- Operate boats in compliance with USCG regulations. After consultation with the field team staff, boat subcontractors are expected to provide a float plan, including the estimated schedule for completing the designated sampling locations and travel routes of operational vessels, to the Field Team Leader
- Have effective systems in place for navigational data processing and deliverables

The subsurface sediment core collection subcontractor will be required to operate the vibracore sample apparatus in conjunction with the field team staff. The subcontractor selected to perform this work must meet the following qualifications:

- Demonstrate experience with collecting cores from urban waterway environments with successful recovery
- Ability to collect cores to the required penetration depth
- Boat operation qualifications as describe above

The hydrographic survey subcontractor will be required to perform the bathymetric, side-scan sonar, and magnetic surveys of the Study Area. The subcontractor selected to perform this work must meet the following qualifications:

- Demonstrate experience in urbanized waterways and in varying water depths
- Have boat, crew, and equipment to be used for the bathymetric, side-scan sonar, and magnetic surveys as necessary to complete the work identified in the RI/FS Work Plan
- Have captains and crew with proper training/licensing (e.g., USCG licensing and OSHA certification)
- Perform work in accordance with the United States Army Corps of Engineers (USACE) Hydrographic Survey Manual EM 1110-2-1003, dated January 1, 2002 for Navigation and Dredging Support Surveys for Soft Bottom Materials
- Use control points established by land-based surveyor subcontractor (as described below)

- Be capable of providing reports of surveys, processed data, and tables identifying and explaining observations of interest

An aerial survey subcontractor will be required to perform the low-angle aerial survey of the Study Area. The subcontractor selected to perform this work must meet the following qualifications:

- Have aircraft, staff, and equipment to be used for the low-angle aerial survey
- Have captains and crew with proper training/licensing
- Comply with survey methodology requirements including direction, coverage, and angle of imagery
- Be capable of capturing images that meet pixel requirements and assign images to New York State Plane coordinates, using the 1983 North American Datum (NAD83 using NYLI)
- Provide the applicable coordination with federal agencies for clearance to perform survey efforts.
- Provide deliverables including a survey report, processed imagery, and shape files of the photographs taken

A land-based surveyor subcontractor will be required to establish control points for hydrographic and aerial surveys. The subcontractor selected to perform this work must meet the following qualifications:

- Be a New York State-licensed surveyor
- Be capable of establishing the horizontal coordinates and elevations of base stations and surface water gauge stations relative to the North American Vertical Datum 1988 (NAVD88) and all horizontal coordinates relative to NAD83 using NYLI.
- Be capable of establishing control points
- Have previously conducted similar surveys near the Study Area

A specialty subcontractor will be required to install, maintain, and service current meters at five locations throughout the study area. The subcontractor selected to perform this work must meet the following qualifications:

- Demonstrate experience in urbanized waterways and in varying water depths

- Have boat, crew, and equipment to be used for the current meter and data collection as necessary to complete the work identified in the RI/FS Work Plan including acoustic Doppler current profilers (ADCP) and optical backscatter detectors (OBS) nephelometers integrated with conductivity, temperature, and depth
- Have captains and crew with proper training/licensing (e.g., USCG licensing and OSHA certification)
- Operate boats in compliance with USCG regulations. After consultation with the field team staff, boat subcontractors are expected to provide a float plan, including the estimated schedule for completing the designated sampling locations and travel routes of operational vessels, to the Field Team Leader
- Have effective systems in place for navigational/current meter data processing and deliverables

A specialty subcontractor will be required to collect the samples for and to conduct the Sedflume analyses of sediment stability. The subcontractor selected to perform this work must meet the following qualifications:

- Demonstrate experience with collecting cores from and performing sediment stability analyses of urban waterway environments
- Have the required equipment to perform the sediment stability analyses

A specialty subcontractor will be required to transport and dispose of IDW including portions of sediment samples not submitted for analysis, decontamination fluids, PPE, and other potentially contaminated material. The subcontractor selected will be responsible for providing properly labeled 55-gallon DOT-approved drums, generating manifest documentation, and transporting drums to appropriate disposal facilities. The subcontractor selected to perform this work must meet the following qualifications:

- Have the training required by the HASP (Anchor QEA 2011a) including the environmental training (e.g., HAZWOPER) for the proper handling and transportation of disposal of IDW
- Demonstrate familiarity with proper DOT procedures for container labeling and transportation of drums to appropriate disposal facilities

During the course of implementing the Phase 1 RI Field Program, the need for other subcontractors may be identified. When necessary, these subcontractors will need to demonstrate that they have the equipment necessary to perform the required work, experience performing the work in urban areas, capacity to perform required work, and the appropriate licenses, if any, required to perform the work.

Implementation of the Phase 1 RI Field Program will also require the procurement of various materials and equipment including office supplies, health and safety PPE, health and safety monitoring equipment, log books, field computers, equipment and personnel decontamination supplies, field sampling and processing supplies (e.g., bowls, spoons, cameras), ice, equipment calibration supplies, and shipping supplies. These supplies will be procured prior to the initiation of field activities and periodically during the implementation of the field work.

3.3 Procurement of Permits

Per 40 CFR 300.400, *CERCLA* response actions are exempted by law from the requirement to obtain federal, state, or local permits related to any activities conducted completely within the established *CERCLA* site. Therefore permits are not required to conduct sampling during the RI/FS field programs within the Study Area. However, this exemption does not eliminate the requirement to meet (or waive) the substantive provisions of permitting regulations that are applicable or relevant and appropriate requirements (ARARs). Specific notifications identified for the Phase 1 RI Field Program are summarized in Table 3-1.

3.4 Identification of Potential Utility or Other Hazards in Navigation Channel

According to the New York State Department of Transportation (NYSDOT) there are approximately 15 pipelines, 15 submarine cables, and 1 tunnel that cross Newtown Creek (NYSDOT 2005). State law requires that a utility clearance be performed prior to initiation of any subsurface work. This requirement also applies to work on water where there may be submerged utilities. To request a mark-out of natural gas, electric, telephone, cable television, water, and sewer lines for the Study Area, contact Underground Utilities 811 or New York City Long Island One Call Center at 800-272-4480.

In addition to One Call, a detailed search of underground utilities in the Study Area will be conducted. As part of this process, a Freedom of Information Act (FOIA) request will be submitted to USACE to identify submerged permitted utilities running along and underneath the Study Area. An underwater utility locating firm will also be procured to identify underwater utilities.

A magnetometer survey will also be conducted of the Study Area. The results of this survey may also assist in the identification of utility crossings and identify obstructions that may require relocation of samples or other adjustments to the field sampling program. Additionally the shoreline assessment will be used to identify utility crossings that are identified along the shoreline. Based on the results of the One Call, FOIA request, underwater utility locating firm data, magnetometer survey, and shoreline assessment, specific utilities identified will be contacted via telephone to confirm the presence or absence of utilities and to obtain any additional information from the respective companies including as-built engineering drawings or other documentation. Work will not begin until the required utility clearances have been performed and utility crossing have been identified, confirmed, and mapped. All sediment sampling stations will then be reviewed in relation to utility locations and relocated or adjusted in coordination with USEPA. To be conservative, stations for sediment sampling will be at least 30 feet vertically or at least 50 feet horizontally from any utilities or related infrastructure.

The One Call utility mark-outs include a 10-day expiration date beyond which the mark-out is not valid unless markings are preserved. One Call utility marking will be preserved in the field by surveying with DGPS. Subsurface sediment collection occurring 6 months after the mark-out and USACE crossing review will require an update of the One Call utility mark-outs and an update of utility crossing review with the USACE.

3.5 Surveying of Control Points for Hydrographic and Aerial Surveys

Control points will be required for the hydrographic and aerial photography surveys. Four control points will be installed by a licensed New York State surveyor. Horizontal coordinates and vertical elevations of the control points will be established. Elevations will include ground surface and top of control point elevations for each control point. All vertical measurements will be surveyed relative to the NAVD (NAVD88), and all horizontal coordinates will be measured relative to New York State Plane coordinates, NAD83 using NYLI.

3.6 Establishment of Staff Gauges at Control Points

Accurate water levels will be required for all on-water sampling activities so that samples can be correlated to accurate elevations. Water levels will be measured at staff gauges established at two of the four control points, near the mouth of Newtown Creek and toward the headwaters of the Study Area. These staff gauges will be surveyed for location and elevations with the control points. Each staff gauge will include a 4-inch-wide staff board, marked at every foot, tenth of a foot, and 0.02 of a foot for manual visual measurements of water level elevation. Staff gauges will be mounted to a piling or structure at the two control points so that water levels indicated by markings on the tide board can be visually observed from the water. The tide boards will be installed such that markings correspond to surveyed elevations determined at each location. Pressure transducers will be installed in a stilling well for electronic measurements of water level elevations at each location. Stilling wells will consist of a perforated PVC pipe mounted to a piling or structure such that the pressure transducer installed within the pipe remains submerged throughout all tidal cycles. Pressure transducer depths will be calibrated at each activation period to the surveyed elevation at the top of the stilling well at the time of installation. Pressure transducers will be activated during the period of each field sampling activity.

Table 3-1
Notification Requirements

Permit/Notification	Review/ Approval Time Required	Hydrographic Surveys	Aerial Photography Survey	Shoreline Assessment	Air Monitoring	Sediment and Sedflume Sampling	Surface Water Monitoring/ Sampling	Current Meter Deployments	Ecological Habitat Survey and Biological Evaluation	Boat-Based Shoreline Habitat Survey	Land-Side Habitat Survey
US Coast Guard Vessel Traffic Service Notification Letter	10 business days	x		x	x	x	x	x	x	x	
Homeland Security Notification	1-7 business days	x		x	x	x	x	x	x	x	
New York City One-Call Mark-out Notification	4 business days					x			x		
Bridge Notifications	For most bridges, 2 – 4 hours	x		x	x	x	x	x	x	x	

Notes:
Hydrographic surveys include bathymetric, side-scan sonar, and magnetic surveys.
Sediment and Sedflume Sampling includes surface sediment sampling, subsurface sediment sampling, and sedflume sampling.
Ecological Habitat Survey and Biological Evaluation includes a benthic community survey and a fish community survey.

4 BATHYMETRIC, SIDE-SCAN SONAR, AND MAGNETIC SURVEYS

This section describes the procedures that will be followed to perform the bathymetric, side-scan sonar, and magnetic surveys.

4.1 Overview

Purpose. The purpose of the bathymetric, side-scan sonar and magnetic surveys is to:

1. Establish the bottom topography and depths for modeling domain
2. Locate obstacles (including utilities) or other impediments that may require refining of sampling locations
3. Assist in the evaluation of sediment depositional history and stability
4. Evaluate scour and depositional zones for the ERA
5. Evaluate the location and size of sediment mounds and deltas at outfalls

This information will be used for various purposes during the RI, including revising the CSM, adjusting sample locations, performing hydraulic analyses and associated computer modeling, performing contaminant fate and transport modeling, and conducting the ERA.

Existing Data Review. Bathymetric information is available for portions of the Study Area from the work conducted during the Operable Unit 6 (OU6) RI, from the draft *City-Wide Long Term CSO Control Planning Project, Newtown Creek, Waterbody/Watershed Facility Plan Report* (NYCDEP 2007), from the *Joint Application for the Water Pollution Control Plant Maintenance Dredging of Newtown Creek and Whale Creek Canal* (NYCDEP 2009), and from the USACE 2009 survey (USACE 2009). These surveys have been performed with varying methodologies in various portions of, but not the whole, Study Area. Side-scan sonar and magnetic surveys of the Study Area are not available.

Data Gap Assessment Relative to CSM. Based on review of available data, there are data gaps for detailed bathymetric survey data along portions of the Study Area and for side-scan sonar data and magnetic survey data along the entirety of the Study Area. In order to continue to refine the CSM, bathymetric, side-scan sonar and magnetic data will be required along the entirety of the Study Area.

Summary of Work to be Performed to Close Data Gaps. Data gaps will be addressed through obtaining and evaluating existing data and supplementing the existing data with new bathymetric, side-scan sonar, and magnetic surveys.

The following activities are included in the bathymetric, side-scan sonar, and magnetic surveys task:

- **Existing Data Review** – Compilation of existing surveys of the Study Area to evaluate and summarize their quality, extent, and applicability for use
- **Bathymetric Survey** – Completion of a bathymetric survey of the entire Study Area
- **Side-Scan Sonar Survey** – Completion of a side-scan sonar survey of the entire Study Area
- **Magnetic Survey** – Completion of a magnetic survey of the entire Study Area

Figure 4-1 presents an example of the conceptual hydrographic survey lines for a portion of the study area. These survey lines may be changed in the field based on field conditions at the time of the surveys and based on the equipment used to perform the surveys.

Because the sediments within the Study Area are enriched in organic matter and, as a result, contain gas bubbles, sub-bottom profiling will not be part of this survey. The gas content in sediments reduces the effectiveness of sub-bottom profiling by prohibiting acoustic signal penetration, absorbing or scattering most of the acoustic energy back to the surface (USEPA 1994).

4.2 Procedures

This section describes the procedures that will be followed to perform the bathymetric, side-scan sonar, and magnetic surveys. These surveys will be conducted in accordance with the methods described in the USACE EM 1110-2-1003, "Hydrographic Surveying," dated January 1, 2002. All of the tasks described in this section will be documented and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c).

4.2.1 Existing Data Review

Available bathymetric, side-scan sonar, and magnetic survey data for the Study Area will be reviewed and summarized by collection date, spatial extent, and methodology. When available, these data will be stored in the project files in electronic georeferenced format. Other data will be stored in the available electronic format and paper copies of surveys will be scanned for storage in Portable Document Format (PDF). Data will be stored in accordance with the DMP (Anchor QEA 2011c). The existing data will be used along with the data collected during the RI to evaluate changes in Study Area conditions over time.

4.2.2 Hydrographic Surveys

The bathymetric, side-scan sonar, and magnetic surveys will be completed of the Study Area at the beginning of the Phase 1 RI Field Program. These surveys will cover the entire length of the Study Area. These boat-based surveys will be conducted by one field team staff member, a boat captain, and the boat crew, as needed. The boat and crew will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a). Based on the water depths in the Study Area, mobilization of a larger survey vessel and a flat-bottom boat will be required. In order to obtain the required data, the survey of shoreline and shallow areas should be scheduled around high tides.

4.2.2.1 Pre-Assessment Activities

Pre-assessment activities will be completed prior to initiating the hydrographic surveys. These activities are summarized below.

- Ensure that required permits and notifications for the work within the Study Area have been submitted and approved for the day's activities (see Table 3-1)
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the hydrographic surveys
- Check tide charts for water level conditions for the survey period and developing an appropriate schedule to ensure the survey is complete
- Check and document on daily logs weather conditions for the 72 hours prior to the shoreline assessment to determine if observations of water discharges made during the hydrographic surveys are occurring under dry weather or wet weather conditions
- Prepare a daily float plan that lists a plan for communication between the land-side

and boat-based field team staff and the area to be surveyed

- Check that the water level pressure transducers are working properly, by connecting each water level pressure transducer to a computer and checking operation and recently collected data in accordance with manufacturer's directions

4.2.2.2 Assessment Activities

On each day of the surveys, the designated field team staff will check in with the Field Team Leader to confirm the schedule and location to be surveyed and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

During the hydrographic surveys, and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids) and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

Also during the hydrographic surveys, and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

Bathymetric Survey. Due to the shallow depth of the Study Area, which prevents the use of a multi beam survey system over much of the Study Area, the bathymetric survey will be conducted using a single beam survey system. Transect spacing will be sufficient close to provide data at approximately 10-foot spacing. The bathymetric survey will be conducted along longitudinal (i.e., shore-parallel) transects approximately 20 feet apart throughout most of the survey area. These longitudinal transects will be augmented by shore-perpendicular "cross-tie" transects spaced approximately 200 feet apart.

Survey equipment to be used includes an integrated hydrographic survey system consisting of a personal computer (PC)-based data collection and navigation system, fathometer, 208 kilohertz (kHz; nominal), transducer, and Differential Global Positioning System (DGPS) positioning capable of on-the-fly sub-meter horizontal accuracy. The navigation system shall calculate XY positions in the required grid system and provide a steering display for the vessel operator. The DGPS will be interfaced with hydrographic data acquisition software to depict the progress of the survey using georeferenced base maps to ensure that the entire survey area is adequately ensonified.

The survey will be performed at a horizontal accuracy of 1 foot and a vertical accuracy of approximately 0.1% of the water depth with a resolution of 0.1 foot. System accuracy will be checked before and after the survey using the "bar check" method at depths beneath the echosounder's transducer of 5, 10, and 20 feet below the water surface. Digital soundings will be compared to these absolute depth values to ensure that accurate deployment parameters have been used. Additional calibrations will be conducted in-situ twice per day by collecting water column profiles of sound velocity. Sound velocity in water can be determined based on measurements of temperature and salinity. The calculated sound velocity profiles will be used to adjust raw soundings. All calibrations will be recorded.

Measured depths will be converted to NAVD88 bottom elevations based on water level elevation and gradient data recorded using a pair of time-synchronized pressure transducers installed at control points established at opposite ends of the survey area (see Section 3.5).

These transducers will be used to correct the soundings for tide height or time gradients that may occur over the length of the waterway.

Navigation for the surveys will be accomplished using a DGPS and compass so that a horizontal accuracy of 0.6 meters (95% confidence interval) is achieved. The DGPS and the echosounder will be interfaced to a shipboard computer running HYPACK® hydrographic surveying software, or the equivalent.

Side-Scan Sonar Survey. The side-scan sonar survey will be conducted concurrent with the bathymetric and magnetic surveys. The surveys will be conducted along longitudinal (i.e., shore-parallel) transects. A 100% bottom search with 200% bottom coverage for all accessible portions of the Study Area will be required. Survey equipment to be used includes an integrated hydrographic survey system consisting of a PC-based navigation system, a side-scan sonar towfish operator using a combination of 100 and 500-kHz signals and various range settings to optimize the system configuration to suit actual field conditions, and data acquisition software. Precise measurements of towfish layback will be recorded to obtain an accurately georeferenced sonar mosaic and other imagery in real time. The altitude of the towfish will be maintained at no greater than 20% of the range setting unless justified by navigational hazards or debris, in which case, the altitude and duration will be documented at the time of the survey.

The reported accuracy of the locations and dimensions of identified sonar contacts greater than 1 meter in any dimension will be quantified and accompanied by a quantified statement of uncertainty (with regards to position and dimension). The nature of each identified contact will be described and incorporated into a Geographic Information System (GIS) database accompanied by position and object measurements.

Magnetic Survey. The magnetic survey will be conducted concurrent with the bathymetric and side-scan sonar surveys. The magnetic survey will be used to determine the locations of ferrous objects in the waterway. The surveys will be conducted along longitudinal (i.e., shore-parallel) transects. The magnetic data will be collected using a system capable of at least a 1 hertz (Hz) digital output and 0.2 nanotesla (nT) resolution. The magnetometer altitude will not exceed 5 meters off the bottom during data collection. The magnetic sensor will be towed at least 1.5 to 2 times the survey vessel length away from the vessel to avoid field interference. The location, magnitude, and signature characteristics of all identified anomalies will be recorded.

4.2.3 Equipment Decontamination

Survey equipment will be in contact with Study Area media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

4.2.4 Investigation Derived Waste

IDW will not be generated during the performance of the surveys. However, IDW will be generated during equipment decontamination. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

4.2.5 Standard Operating Procedures

The following SOPs, which include sample data collection forms as applicable, are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal

4.2.6 Materials and Equipment

The materials and equipment that may be required to complete these procedures is provided in Table 4-1.

4.3 Data Processing, Evaluation, and Management

Data collected during the bathymetric survey, side-scan sonar survey, and magnetic survey will be stored in the project files and will be used to develop GIS layers with relative water depths converted to bottom elevations accurate to 0.1 foot in the NAVD88 and horizontal position accurate to 1 foot in the NAD83 using NYLI. Magnetic surveys will be processed and stored digitally in the project files and will be used along with utility clearance information to adjust sample locations, if necessary.

Bathymetric survey data will include bathymetry data in electronic format (ASCII X,Y,Z) and bathymetry contours at 1-foot intervals plotted in hardcopy (1 inch = 200 feet scale) and in digital AutoCAD-compatible and ArcView GIS-compatible formats. Side-scan sonar survey will include processed sonar data in georeferenced joint photographic experts group (JPEG) formats suitable for viewing and analysis using ArcView GIS, ArcGIS Explorer, AutoCAD, and other GIS software, and a summary table identifying and explaining features of interest including target positions. The magnetic data will include the location, magnitude, and signature characteristics of all identified anomalies in an electronic format that is compatible and directly importable to ArcView GIS and a survey report that provides an interpretation of each magnetic anomaly detected during the survey.

The data will be evaluated to adjust station locations for the sediment sample collection and current meter placement activities and for refining ecological survey locations, as necessary. The hydrographic data will be used in the ERA in developing the BERA Problem Formulation. The data will also be evaluated to update the CSM and for use in the hydraulic analysis and associated computer modeling. The results of the hydrographic surveys will be evaluated to identify areas of sediment accumulation and loss which will assist the contaminant fate and transport modeling.

4.4 Reporting

Upon completion of the surveys and an initial quality review by the Project QA Coordinator or designee, the data will be compiled into summary maps with supporting text. These maps will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

4.5 Schedule

The hydrographic surveys are planned to be one of the initial tasks of the RI Phase 1 investigation. These surveys are intended to be conducted prior to the sediment and surface water sampling activities. The schedule will be dependent on weather and field conditions.

It is anticipated that these surveys will require two months to collect, process and review the data.

Table 4-1
Bathymetric, Side-Scan Sonar, and Magnetic Survey Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT-approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 - Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Cell phone
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30 specifications/Factory Manual [FM] approved)
- Clipboard
- Compass

Table 4-1
Bathymetric, Side-Scan Sonar, and Magnetic Survey Materials and Equipment

- Deionized (DI) "analyte-free" water
- Digital cameras
- Drum cart
- Drum wrench to tighten open-top drum lids
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Hand-held electronic recording device (optional)
- Ethylacetate
- High-pressure/steam cleaner (if required)
- IDW log form
- Integrated hydrographic survey system consisting of the following:
  - 208 kHz (nominal) transducer
  - Differential Global Positioning System (DGPS) positioning cable capable of on-the-fly sub-meter horizontal accuracy
  - Fathometer
  - Personal Computer-based data collection and navigation system
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Printer/scanner
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Standardized field data forms (hard copy and/or electronic)
- Study Area maps
- Tap water source (any treated municipal water supply)
- Three-ring binder or equivalent
- Time piece
- Zipper-lock bags

Table 4-1
Bathymetric, Side-Scan Sonar, and Magnetic Survey Materials and Equipment

See the following SOPs for further details:

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 4-1 Conceptual Hydrographic Survey Lines.mxd lhudson 10/14/2011 3:17:26 PM

ANCHOR QEA

Notes:
Survey lines are conceptual and may be modified in the field at the time of the survey. The limited area shown here represents an example of the survey lines that will be traversed in all parts of the Study Area for the bathymetric, side-scan sonar, and magnetic surveys.

Figure 4-1
Conceptual Hydrographic Survey Lines
Field Sampling and Analysis Plan
Newtown Creek RI/FS

5 AERIAL PHOTOGRAPHY SURVEY AND SHORELINE ASSESSMENT

This section describes the procedures that will be followed to perform the aerial photography survey and shoreline assessment.

5.1 Overview

Purpose. The goal of the aerial photography survey and shoreline assessment is to document the physical characteristics of the Study Area shoreline. These activities will also support the identification of upland sources of loadings to the Study Area; evaluate the presence, absence, and general condition of bulkheads along the Study Area; identify access points to the Study Area from the shoreline; and be used in the habitat survey and biological evaluation portion of the ERA process to identify potential bird and mammal habitat at or near the shoreline (see Section 12 for additional details on the habitat identification effort) and the presence of wetlands.

Existing Data Review. There are publicly available historical and current aerial photographs of the Study Area. These photographs are not of the quality or at the proper orientation to meet the goals of this task. Additionally, comprehensive shoreline assessments have not been identified.

Data Gap Assessment Relative to CSM. An aerial photography survey represents a data gap. In order to best develop the CSM, high resolution, low-angle oblique aerial photography of the entire Study Area at low tidal elevations will be necessary. The shoreline assessment represents a data gap, as well.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed by obtaining and evaluating existing photographs and supplementing existing data with a low-angle aerial photography survey and by performing a shoreline assessment. The following activities are included in the aerial photography survey and shoreline assessment:

- **Existing Data Review** – Review of existing basemaps, GIS layers, and aerial photographs of the Study Area to evaluate and summarize their quality, extent, and applicability for use during the shoreline assessment and boat-based and land-side ecological surveys

- **Aerial Photography Survey** – Completion of an oblique aerial photography survey at or near low tide at the beginning of the Phase 1 RI Field Program to develop/expand the aerial photography coverage of the shoreline
- **Shoreline Assessment** – Completion of a boat-based shoreline assessment at or near low tide at the beginning of the Phase 1 RI Field Program to verify existing data and to develop/expand the GIS spatial database of shoreline type and features

5.2 Procedures

This section describes the procedures that will be followed to perform the aerial photography survey and shoreline assessment. All of the tasks described in this section will be documented and stored in the project files as described in the DMP (Anchor QEA 2011c). During shoreline survey activities, field conditions will also be documented. Field notes will be maintained in a log book, on the Daily Activity Log (see SOP NC-01 – Field Records for sample form), and on data collection forms.

5.2.1 Existing Data Review

Publicly available basemaps of the Study Area and surrounding areas (USGS quadmaps, National Oceanic and Atmospheric Administration [NOAA] navigational charts, Federal Emergency Management Agency [FEMA] floodmaps, and the 1974 Tidal Wetland maps) will be reviewed as an initial step in the aerial photography survey and shoreline assessment. These data will be catalogued and summarized to indicate publication date, resolution, and extent of coverage. In addition to basemaps, publicly available GIS layers of shoreline features will also be reviewed and summarized. These data may include features relevant to determining potential upland sources, pipe discharges, structural features of the Study Area (including utility crossings, bridges, and bulkheads), and the presence of wetlands.

Historical and recent aerial photographic images of the Study Area will also be reviewed as part of the existing data review. These images will be catalogued and summarized to indicate date collected, resolution, relative tidal state, and coverage extent.

Relevant results from the basemap, GIS, and aerial photography review will be compiled into a comprehensive GIS-based mapbook of the Study Area for use during the shoreline assessment and surveys. The mapbook will be organized to present specific sections of the Study Area (length to be determined) and serve as a guide for identifying data gaps for the shoreline assessment. The mapbook will be updated as new information, e.g., aerial photography survey, is obtained.

5.2.2 Aerial Photography Survey

An aerial photography survey will be performed by a subcontractor following the procedures described in this section. Depending on the subcontractor selected for this survey, changes to these procedures may be necessary and will be documented as described in Sections 1.7 and 1.8.

The aerial photography survey will consist of a survey along the length of Newtown Creek and its tributaries and will include the Study Area banks to a distance of 50 feet from the low tide shoreline. The aerial photography will be performed at an altitude of 1,000 feet above the ground surface. It will be conducted within one hour of low tide to maximize the exposed shoreline and between the hours of 10:30 am and 1:30 pm to minimize shadows. The black and white aerial photography will be obtained using low altitude/high accuracy photography. The aircraft used for the aerial photography survey will be properly equipped and will comply with all Federal Aviation Administration (FAA) and Civil Aeronautics Board (CAB) regulations. The crew will contact the local aircraft control towers to coordinate the flight paths. A land-based surveyor subcontractor will be required to establish control points for the hydrographic and aerial surveys and requirements as outlined in Section 3.2.

Horizontal and vertical control for the survey will be established using global positioning system (GPS) satellite receivers. Four survey-control points, two on either side of the Study Area and located spatially along the Study Area, will be established. These control points will be located so that they can also support the hydrographic surveys (see Section 3.5). In addition to control points, targets will be set at specified intervals on the ground adjacent to the Study Area and along adjacent roadways. The elevations on these targets will be derived by a combination of GPS and differential leveling procedures. Using these control points and targets horizontal positions will be calculated, checked and adjusted into the New York State

Plane Coordinate System of NAD83 using NYLI. The vertical control will be adjusted to elevation reference of NAVD88.

Digital Terrain Modeling (DTM) procedures will be used to evaluate the aerial photographs for shoreline features. Break lines will be identified including pavement edges, edge of paved shoulders, curb lines, lane lines, tops and toe of slopes, tops and bottoms of ditches, water lines and other observed features. Using the photography, break lines and elevations will be digitized by the subcontractor along the bottom and top of the banks of the Study Area and on the road surfaces. The planimetric features will be digitized directly at 1 inch equals 30 feet by photogrammetric methods. The accuracy for the mapping extending to the project limits will be consistent with accuracy requirements for 1 inch equals 30 feet mapping as specified by NYSDOT Land Surveying Standards and Procedures Manual (NYSDOT 2009). Within accuracy requirements the 1-foot contours will be generated to represent true elevation above mean sea level and the exact shape of the ground. Elevations will be read photogrammetrically on bridge deck at deck joints and any other specified surface features. The contour lines will be shown as solid lines and labeled as necessary for map clarity.

The digital file will contain all land use features within the limits of the survey, such as Newtown Creek and its tributaries, shoreline type, buildings, roads, railroads, billboards, poles, parking lots, sidewalks, signs, catch basins, manholes, trees, etc., visible on or interpretable from the aerial photography. These features will all be digitized on a separate Computer-Aided Drafting and Design (CADD) layer with the appropriate symbol and line type. Those features located flush with the ground, such as outfall pipes, manholes, valves, and surface evidence of utilities, etc., will be digitized into the base mapping, where visible. Those features not visible in the photography (such as, manholes, inlets, pipes, junction boxes, posts, guide rails, etc.) will be located by conventional survey methods during supplemental surveys then added to the CADD file on the appropriate layer. Supplemental surveys will be limited to the Study Area and include dimensions of bridge openings and the low chord elevation at the bridge fascia. No locations will be obtained below structures. Field and photogrammetric data will be added to the CADD file. All photogrammetry mapping will conform to the geodetic control standards and specifications in the NYSDOT standards (NYSDOT 2009).

5.2.3 Shoreline Assessment

A boat-based shoreline assessment will be completed of the Study Area at or near low tide at the beginning of the Phase 1 RI Field Program. This assessment will cover the entire length of the Study Area. A schedule for the shoreline assessment will be developed based on occurrence of low tide; the assessment will only be conducted three hours before and after low tide. The shoreline assessment will be conducted by two field team staff, a boat captain and the boat crew, as needed, working from a boat. The boat and crew will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a).

During the shoreline assessment and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (e.g., fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (e.g., sheens, color, and solids) and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled opportunistically during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of the visual surveys and will be documented in a Field Modification Form (see SOP NC-01 – Field Records) submitted to USEPA. Opportunistic samples may be collected during the shoreline assessment; samples would be collected in conformance with the field modification process described in Section 1.7. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

Also during the shoreline assessment and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented. The types of potential recreational activities that the field team staff will look for will include kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

5.2.3.1 Pre-Assessment Activities

Pre-assessment activities will be completed prior to initiating the shoreline assessment. These activities are summarized below:

- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the shoreline assessment
- Checking tide charts for water level conditions for the survey period and developing a schedule to ensure survey occurs at or near low tide
- Checking weather conditions for the 72 hours prior to the shoreline assessment to determine if observations of water discharges made during the shoreline assessment are occurring under dry weather or wet weather conditions
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions
- Preparation of a daily float plan listing a plan for communication between the land-side and boat-based field team staff and the area to be assessed
- Obtaining final sample table for opportunistic water samples from the Project Chemist. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the opportunistic water sample table.

5.2.3.2 Assessment Activities

On each day of the shoreline assessment, the two designated field team staff will check with the Field Team Leader to confirm the schedule and location to be surveyed and collect the appropriate survey and communications equipment and the mapbook for the areas to be surveyed. Sample containers for opportunistic sample collection will also be loaded onto the boat (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7). In addition to the daily health and safety meeting conducted by the POSO, a daily safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices, and radios), has conducted a communications check, and has filed a float plan. The field team staff will board the boat and follow SOP NC-04 – Navigation and Boat Positioning for navigation and positioning guidance to their survey location.

Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy. Descriptive attributes of shoreline features will be captured including:

- Shoreline type (e.g., riprap, bulkhead) and condition (e.g., deterioration, cracks, seeps)
- Utility crossings
- Outfalls/pipes/seeps
- Flowing water out of pipes or overland sheet flow
- Navigational obstructions
- Access points (including nature and condition)
- Wetland features
- Eroding banks
- Vegetation
- Fauna
- Accumulation of floatables (waste materials floating on the water)
- Sheens
- Confirmation of the presence/absence of over-water features shown on the aerial survey (e.g., piers, pilings)
- Recreational use
- On-water recreation
- Industrial uses
- Other features of note

Descriptive attributes recorded for shoreline features may include dimensions, structural condition, material, flow, odor, and debris. The GPS program will include data entry forms to standardize data collection, improve efficiency, and reduce post-processing requirements. The program will be loaded with background layers identified in the data review portion of the shoreline assessment for reference, ground-truthing, and updating. Digital photographs of identified shoreline features will also be taken and recorded in the attribute record on the electronic data form. If a shoreline feature or activity is not approachable by boat due to channel conditions, safety concerns, or obstructions, a GPS offset or digitized location will be collected instead.

Opportunistic water samples may be collected during the shoreline survey. Should the boat-based field team staff identify a location for an opportunistic water sample, the field team staff will contact the Field Team Manager to consult with him on the location. The sample would be collected using the procedures in Section 10.2.4. A decision on whether the sample would be analyzed would be made using the field modification process described in Section 1.7.

At the end of each day of the shoreline assessment, field team staff will return assessment and communications equipment, log forms, and field records to the field facility. Field team staff will provide the field records to the Field Team Leader who will review the field data collected as described in NC-01 – Field Records and the DMP (Anchor QEA 2011c). From the field facility, the Field Team Leader will send the electronic assessment data collected during the day to the Data Management Task Manager or a designee.

5.2.4 Equipment Decontamination

None of the equipment used for the aerial photography survey or shoreline assessment will come in contact with Study Area media; therefore, no equipment decontamination will be required, unless opportunistic samples are taken. If opportunistic samples are taken, equipment decontamination will be performed following the procedures described in SOP NC-02 - Equipment Decontamination.

5.2.5 Investigation Derived Waste

IDW from Study Area media will not be generated during the performance of the aerial photography survey or shoreline assessment, unless opportunistic samples are taken. If opportunistic samples are taken, IDW will be generated during the performance of the surface water sampling equipment decontamination. PPE will also be generated as IDW and will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

5.2.6 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal

5.2.7 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 5-1.

5.3 Data Processing, Evaluation, and Management

As described above, relevant results from the existing basemap, GIS, aerial photography review, and aerial photography performed for the RI/FS will be compiled into a comprehensive GIS-based mapbook of the Study Area for use during the shoreline assessment. The mapbook will be organized to present specific sections of the Study Area (length to be determined) and serve as a guide for identifying data gaps for the shoreline assessment.

As also described above, the data collected during the aerial photography survey will be processed by the subcontractor. The data will be archived in a digital format compatible with Geodatabase files. Images will be delivered in Tagged Image File (TIF) or JPEG format. These photographs, including the shoreline information, will be added to the mapbook and will be used during the shoreline assessment.

Electronic data collection forms and GPS locations from the shoreline assessment will be sent to the Data Management Task Manager or a designee and saved to the project files and the field facility computer. Data collected from the shoreline assessment will be loaded into a GIS-based spatial database. Data will be compared to previously reviewed GIS data layers and basemaps to assess data quality and potential coverage gaps. The spatial database will be maintained and updated with additional features identified through subsequent tasks in the RI/FS.

5.4 Reporting

Following review by the Data Management Task Manager, the results of the aerial photography survey and shoreline assessment will be complied into GIS map layers with accompanying text. These GIS layers will be included in the Phase 1 RI Addendum, Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

5.5 Schedule

Obtaining and reviewing existing data are planned to be conducted as part of initial mobilization tasks. The aerial photography survey is intended to be conducted first followed by the shoreline assessment which will be performed following receipt of preliminary aerial photography. The aerial photography survey and shoreline assessment (mapping and reconnaissance) are intended to be initial tasks conducted as part of the RI Phase 1 field efforts and will be conducted prior to the collection of Study Area media samples. It is anticipated that the aerial photography survey will require 10 weeks of infield activities (set control points, fly survey, and perform supplemental surveys), including 1 week to schedule the flight and abide by additional restrictions to fly in this area due to the airport traffic and the requirement that the survey be accomplished at low tide and between 10:30 am and 1:30 pm.

Following the in-field activities, it will take approximately 3 weeks for the aerial survey subcontractor to process and report the results. Once aerial photographs have been produced for use as base maps during the shoreline assessment and for field-verification of aerial survey interpretation, it is anticipated that the shoreline assessment will require 2 weeks of on-water activities conducted at low tide over 1 month and 2 months to process and review the data. The schedule for each of these activities will be dependent on weather and field conditions.

Table 5-1

Shoreline Assessment Materials and Equipment

- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bung tool to open closed-top drums
- Cell phone
- Clipboard
- Custom GPS program
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
- Marine VHF (high frequency) radio
- Navigation charts (electronic)
- Pre-determined sampling coordinates/waypoints and locations figure;
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Study Area maps
- Three-ring binder or equivalent

Table 5-1

Shoreline Assessment Materials and Equipment

- Time piece

See the following SOPs for further details:

- NC-01 Field Records
- NC-04 Navigation/Boat Positioning

6 AIR MONITORING

This section describes the procedures that will be followed to perform the air monitoring.

6.1 Overview

Purpose. The objectives of the air monitoring program are threefold:

- To evaluate baseline concentrations of specific airborne chemicals
- To measure the level of ambient concentrations that would be experienced within the breathing zone on or along the Study Area
- To estimate the portion of the measured concentrations that is potentially attributable to the Study Area

Although "a release of hazardous substances to air is not observed or suspected" (Weston 2009), air sampling will also be conducted as appropriate during other field efforts to characterize and facilitate the control of emissions arising from RI activities and to ensure the protection of personnel performing field sampling and sample processing and the public. Air monitoring during RI field activities is detailed in the HASP (Anchor QEA 2011a).

Existing Data Review. Available background regional air quality data will be researched and considered for use with evaluating the RI data. NYSDEC maintains the New York State Volatile Organic Compound Ambient Monitoring Network, which monitors VOCs across the state (http://www.dec.ny.gov/chemical/8538.html). Several NYSDEC VOC monitoring stations in Queens and Kings County, New York, have been identified and data from these stations will be collected and reviewed. The stations are identified as PS 274 Kosciusko School (800 Bushwick Ave, Brooklyn, NY 11221), College Pt. Post Office (120-07 15th Ave, Queens, NY 11356), and PS 219 Queens College (14439 Gravett Rd., Queens, NY 11367). Data from additional NYSDEC air monitoring stations of interest in the Queens, Brooklyn, and Manhattan areas may be identified after further review.

A search of local meteorological stations will also be conducted to provide additional data on wind direction and velocity near the Study Area. Initially, weather data will be examined from three federally maintained stations in the area. These stations are Automated Surface Observation System (ASOS) stations that are maintained by the Federal Aviation

Administration and the National Weather Service. They are located at La Guardia Airport (Ditmars Blvd. and 94th St , Flushing, NY, 11369), JFK Airport (JFK Expy. & S Cargo Rd., Jamaica, NY 11430), and Central Park (W 59th St. and Central Park West). The data will be downloaded from Weather Underground (wunderground.com) or directly from the NOAA National Climate Data Center (NCDC) database. Other Personal Weather Stations (PWSs) included in the Weather Underground network exist in closer proximity to Newtown Creek, and they will be considered for use after the previously mentioned stations are evaluated. Potential PWSs to be evaluated included stations located in Dutch Kills, Queens; Long Island City, Queens; Middle Village, Queens; and Williamsburg, Brooklyn.

Data Gap Assessment Relative to CSM. Data gaps exist for ambient air monitoring information outside of the Greenpoint area.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed by obtaining and evaluating existing air data and by performing additional ambient air monitoring.

The following activities are included for air monitoring:

- **Existing Data Review** – Review of available background regional air quality data including NYSDEC data for use with the RI data
- **Air Monitoring** – Collection of simultaneous air measurements for VOCs and PCBs at selected locations on opposite sides of the Study Area as well as measurements at a height of about 2.5 feet above the water surface when the wind direction is generally perpendicular to Newtown Creek

Figure 6-1 shows the proposed air sampling locations. Table 6-1 provides the sampling location names, rationale for each sampling location, and planned analyses for each location.

6.2 Procedures

An overview of air data review and air monitoring procedures are described in the following sections. After the local meteorological data and NYDEC data review is conducted and prior to sample collection, air monitoring procedures, including field SOPs, will be refined and discussed with USEPA. All applicable SOPs will be submitted to USEPA for review and approval.

All of the tasks described in this section will be documented and stored in the project files as described in the DMP (Anchor QEA 2011c). During air monitoring activities, field conditions will also be documented. Field notes will be maintained in a log book, on the Daily Activity Log (see SOP NC-01 – Field Records for sample form), and on data collection forms (see SOPs NC-20 – Air Monitoring for Polychlorinated Biphenyls, and NC-21 – Air Monitoring for Volatile Organic Compounds, for sample forms).

6.2.1 Existing Data Review

Available background regional air quality data will be researched and considered for use with evaluating the RI data. NYSDEC maintains the New York State Volatile Organic Compound Ambient Monitoring Network, which monitors VOCs across the state (http://www.dec.ny.gov/chemical/8538.html). Several NYSDEC VOC monitoring stations in Queens and Kings County have been identified and data from these stations will be collected and reviewed. The stations are identified as PS 274 Kosciusko School (800 Bushwick Ave., Brooklyn, NY 11221), College Pt. Post Office (120-07 15th Ave., Queens, NY 11356), and PS 219 Queens College (14439 Gravett Rd., Queens, NY 11367). Data from additional NYSDEC air monitoring stations of interest in the Queens, Brooklyn, and Manhattan areas may be identified after further review.

A search of local meteorological stations will also be conducted to provide additional data on wind direction and velocity near the Study Area. Initially, weather data will be examined from three federally maintained stations in the area. These stations are ASOS stations that are maintained by the Federal Aviation Administration and the National Weather Service. They are located at La Guardia Airport (Ditmars Blvd. and 94th St , Flushing, NY, 11369), JFK Airport (JFK Expy. & S Cargo Rd., Jamaica, NY 11430), and Central Park (W 59th St. and Central Park West). The data will be downloaded from Weather Underground (wunderground.com) initially, and if needed directly from the NOAA NCDC database. Other PWSs included in the Weather Underground network exist in closer proximity to Newtown Creek, and they will be considered for use after the previously mentioned stations are evaluated. Potential PWSs to be evaluated included stations located in Dutch Kills, Queens; Long Island City, Queens; Middle Village, Queens; and Williamsburg, Brooklyn.

If not publically available, FOIA and/or FOIL requests will be made to obtain air monitoring and meteorological data. All data collected will be scanned and added to the project files.

6.2.2 Ambient Air Monitoring

To meet the air monitoring objectives, simultaneous air measurements will be made over a 24-hour period at selected locations on opposite sides of the Study Area as well as measurements at a height of about 2.5 feet above the water surface (see Figure 6-1). The land-side monitors are located on either bank and paired for an upwind-downwind analysis. On-water sample collection instruments will either be deployed on small rafts and anchored to the bottom or deployed via booms that will be extended from the shoreline over the Study Area. The sample locations in Figure 6-1 are conceptual and may be adjusted in consideration of field conditions, the ability to obtain access, and if research completed by the time of sampling indicates the presence of a potential significant air source.

Sampling will be performed for VOCs using SUMMA canisters and for PCBs using Polyurethane Foam (PUF) samplers. The ambient air samples for VOC analysis will be collected in pre-cleaned SUMMA canisters in accordance with the procedures detailed in USEPA Method TO-15, *Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry* (USEPA 1999a). Ambient air samples for PCB analysis will be collected in accordance with the procedures detailed in USEPA *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition Compendium Method TO-10A Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection* (GC/MD; USEPA 1999b).

The monitoring program will also include continuous meteorological measurements at two stations adjacent to Newtown Creek located at a distance from each other to capture spatial variability. Wind patterns will be evaluated based on existing local weather stations around the study area to determine the specific location and height of the two meteorological stations. Additional stations may be identified pending local wind pattern evaluation. There will be three sets of activities conducted as part of the ambient air monitoring:

- Pre-sampling activities including site access verification and field reconnaissance of air sampling stations, establishment of two meteorological stations, testing of equipment, and notification of authorities
- Sampling activities including air sampling equipment mobilization, set up, and completion of air sampling
- Sample processing

6.2.2.1 Pre-Sampling Activities

Pre-sampling site access verification and field reconnaissance of the selected sampling stations will be conducted. These activities are summarized below:

- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the air sampling
- Verify that there is access to the proposed sampling stations
- Verify wind direction and speed using weather forecasts, existing weather stations, and the two meteorological towers. Propose new locations if wind direction for proposed locations does not support an upwind-downwind evaluation
- Ensure that there is sufficient open area to conduct sampling activities
- Train field team staff well in advance of the sampling event with relevant methodology, procedures, and troubleshooting of air sampling equipment
- Test air monitoring equipment and order replacement pieces as needed
- Evaluate level of security at stations for sampling equipment
- Develop knowledge concerning building use and operations around the sampling stations
- Record locations via GPS
- Determine distance and time required to get between stations
- Ensure ability to perform air sampling at all locations contemporaneously, (i.e., start time of sampling period at each station is within a two-hour timeframe) or instantaneously, if timers on sampling equipment prove feasible
- Check weather conditions to ensure that the sampling period will be dry

- Obtaining final sample table from the Project Chemist that will be compiled for each sampling mobilization and organized by station. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.

Sample stations may be relocated to meet space and security requirements or based on wind direction. Based on the travel time between stations, and ensuring contemporaneous sampling periods for all devices, the number of field team staff to conduct the monitoring and specific routes for mobilization and activation of equipment will be determined. In addition, a further assessment of the on-water sampling procedures (i.e., placement on rafts or suspension from booms from the shoreline) will be conducted as part of the field reconnaissance. The selected on-water sampling procedures and sample stations and routes will be discussed with USEPA prior to the sampling event.

The air monitoring task includes the establishment of two meteorological stations using the guidelines presented in *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (USEPA 2000). These meteorological stations will consist of a Climatronics F460 wind sensor or similar equipment, a temperature sensor, and a barometric pressure sensor. If appropriate locations cannot be identified for the establishment of the meteorological stations, a local station with publicly available data will be used. The meteorological stations will collect continuous measurements of wind speed and direction, temperature, and barometric pressure. Data will be collected via an electronic data logger or similar equipment and downloaded to the electronic project files.

The air monitoring task also includes monitoring boat traffic in the Study Area during the 24-hour monitoring period. This monitoring will either be conducted by visual observation or using electronic monitoring. The monitoring method will be identified as part of the pre-sampling activities and will consider factors such as whether on-water sampling will require field team staff that could monitor boat traffic and availability of a secure monitoring location for electronic equipment. The procedures for monitoring boat traffic will be discussed with USEPA prior to the sampling event.

Because sampling equipment will be left unattended during the sampling period and the general public may not be familiar with its appearance, the appropriate authorities (local agencies, land owners, fire, police, and homeland security) will be notified and supplied with a diagram of the sampling equipment set up at least 1 week prior to the sampling. Sample station security is currently under evaluation and will be refined based upon field reconnaissance.

Prior to mobilization, a sample table will be prepared by the Project Chemist. This table will be organized by station and will include station number, sample identification (ID), analyses to be conducted, QA/QC samples required, holding times, preservation, and laboratory information.

6.2.2.2 Sampling Activities

Equipment will arrive at the field facility pre-assembled and pre-tested. Six sets of extra equipment will be delivered to the field facility for substitution in the event of equipment failure. The ambient air monitoring program will be conducted by two to three field teams (each consisting of two to three field staff) on each side of the Study Area (i.e., in Queens and in Brooklyn). Anchor QEA is obtaining additional meteorological data for the area from ASOS stations maintained at LaGuardia airport, JFK airport, and Central Park in addition to PWSs closer to Newtown Creek. Once this information is compiled, and in advance of any field activities, Anchor QEA will provide USEPA with a more detailed approach for both measurements of wind speed and direction, as well as sample collection locations (both for land and water).

Based on the information obtained during the pre-sampling activities, specific routes will be established for each of the field team staff. If on-water samples are collected via rafts, one additional field team will be stationed on the water. If on-water samples are collected from the land, the land-side teams will have these stations on their routes and will be responsible for activating and monitoring the collection devices at those stations. These field team staff will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a). The following activities and sampling procedures will be implemented for air sample collection:

- Air sampling equipment will be mobilized to the designated sampling locations recorded via GPS and set up, but not activated. Field team staff will take a photograph of the sampling set up prior to activation. Refer to sample table from the Project Chemist for stations where QA/QC samples must be collected.

- Wind speed and direction will be verified. Portable wind speed and direction devices may be used at each station to collect a single data point during sampling initiation; however, the prevailing wind will be measured at the meteorological stations.
- Following set up, field team staff will go to the first station on their designated route and activate the air sampling equipment. The time of activation will be noted on the VOC and PCB air sampling forms that will be provided in NC-20 – Air Monitoring for Polychlorinated Biphenyls, and NC-21 – Air Monitoring for Volatile Organic Compounds. The field team staff will then go to each of the other locations in sequential order and activate the equipment at each location, noting the time of activation, functionality of equipment, and environmental conditions (e.g., smoke, fog, odors). The following outlines the procedures for activation of the equipment:
  - For the PUF samplers, field team staff will complete the following steps:
    - Position the sampling assembly with the intake downward or in horizontal position 1 to 2 m above ground level.
    - Carefully remove the clean sample cartridge from the aluminum foil wrapping (the foil is returned to jars for later use) and attach to the pump with flexible tubing.
    - Record cartridge height above ground on the PCB Air Sampling Form.
    - Turn on the pump power switch to begin sampling.
    - Verify the flow rate via the pump rotometer or other device.
    - Field team staff will activate the elapsed time meter and record the start time on PCB Air Sampling Form.
  - For SUMMA canisters, field team staff will complete the following steps:
    - Confirm that valve is closed (knob should already be tightened clockwise).
    - Remove the brass cap and attach gauge.
    - Attach brass cap to side of gauge tee fitting.
    - Open and close valve quickly (a few seconds).
    - Read vacuum on the gauge; if the vacuum is less than 30±1 inches Hg, replace the canister.
    - Record gauge reading at the entry for “Start” in the “Pressure Readings and

Times" column of VOC Air Sampling Form and "Start" on the COC form.

- Verify that canister valve is closed then remove gauge and replace brass cap.
- Attach the flow controller assembly to the canister.
- Open valve allowing the sample to start flowing into the canister. Monitor the progress of the sampling every three hours during the 24-hour period. The volume of air sampled has a linear relationship to the canister vacuum. Thus halfway through the sampling interval, half of the sample will have collected (2.5 liters) and the vacuum gauge should read approximately 17 inches Hg (halfway between 29 inches Hg and 5 inches Hg). The flow controller is calibrated to leave approximately 5 inches Hg residual vacuum in the canister and because of normal fluctuations during sampling the final vacuum will be between 2 and 10 inches Hg. A residual vacuum less than 1 inch Hg indicates that the canister may have come to ambient conditions before the completion of the sampling interval. This will not mean that the sample should be voided; contact the Field Team Leader in this event.

- Field team staff will continue rounds of the air sampling stations so that each station is checked approximately every 3 hours. Field notes will be taken on the VOC and PCB air sampling forms to document functionality of the equipment, pressure in the SUMMA canister, environmental conditions, and damage. Field team staff will take a photograph of the sampling set up.
- At the end of the 24-hour period, equipment will be deactivated in the same order in which it was activated the previous day. Field team staff will take a photograph of the sampling set up before deactivation.
  - For PUF samplers, field team staff will complete the following steps:
    - Turn off the pump, remove the PUF cartridge from the sampler, wrap the cartridge with the original aluminum foil, and placed the cartridge in a sealed, labeled container.
    - Place the sample containers in an insulated cooler containing wet ice to keep samples cold until they can be transported to the field facility sample processing area for packing and shipping to the analytical laboratory as described in NC-14 – Sample Packaging and Shipping.
  - For SUMMA canisters, field team staff will complete the following steps:

  - Close valve by hand tightening knob clockwise.
  - Verify and record final vacuum of canister (repeat steps used to verify initial vacuum) on the VOC and PCB air sampling forms and COCs.
  - Replace brass cap.
  - Return canister to box and place accessories (e.g., gauges, filters) in packaging provided.
  - Complete COC.

- Field team staff will tape the box shut and affix a custody seal across the flap and transport samples back to the field facility sample processing area for packing and shipping to the analytical laboratory.
- All field activities will be documented including air sampling collection activities, custody transfer of the samples, and the PCB and VOC air sampling forms will be filled out in their entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.

6.2.2.3 Sample Processing

Samples will initially be packed in the field as described in Section 6.2.2.2. Once they are packed, the field team staff will conduct the following activities:

- Transfer samples to the field facility under COC per Section 14.2.2 and in accordance with SOP NC-13 – Sample Custody. Once samples are transferred to the field facility, they will be packed and shipped to the analytical laboratory as described in NC-14 – Sample Packaging and Shipping.
- Work with Field Team Leader to ensure field records/forms and photographs are downloaded to the field facility computer at the end of the sampling period.

The Field Team Leader will review the records and forward the records to the Data Management Task Manager.

6.2.2.4 Sample Station and Frequency

One 24-hour period of air monitoring will be conducted. Air monitoring will be conducted at six on-water stations, nine paired upwind-downwind bank stations, and five stations at a distance from the Study Area to evaluate background conditions. Sample stations are shown in Figure 6-1. The Phase 1 RI Field Program includes one round of air monitoring.

6.2.2.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. The nomenclature that will be {station identification}{matrix code}--{date} where:

- Station identification = 5-character identifier for the station identified in Figure 6-1. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Field blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - AR = Air
  - FB = Field Blank
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- An air sample collected at the 26th station of the main Newtown Creek area collected on September 8, 2011 would have the id: NC026AR-20110908
- The duplicate of this sample would have the id: NC1026AR-20110908

6.2.2.6 Sample Handling and Analysis

Ambient samples will be analyzed for VOCs by USEPA Method TO-15 and PCBs by USEPA Method TO-10A. Worksheet #15 (Reference Limits and Evaluation Table) in the QAPP (Anchor QEA 2011b) lists the individual analytes, and Table 6-2 in this FSAP provides the analyses, containers, and laboratory information. Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Further information on the analytical program and specific analytes are provided in the QAPP.

6.2.3 Air Monitoring During Sampling and Processing Activities

Real time air monitoring is not anticipated for this activity.

6.2.4 Equipment Decontamination

Air monitoring equipment positioned for the on-water samples may come in contact with Study Area media. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

6.2.5 Investigation-Derived Waste

IDW will not be generated during the performance of the survey and assessment. However, PPE will be generated as IDW and will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

6.2.6 Standard Operating Procedures

The following SOPs may be relevant to this activity:

- NC-01 – Field Records
- NC-04 – Navigation/Boat Positioning
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-20 – Air Monitoring for Polychlorinated Biphenyls (will be submitted to USEPA

prior to sampling)

- NC-21 – Air Monitoring for Volatile Organic Compounds (will be submitted to USEPA prior to sampling)

6.2.7 Materials and Equipment

The materials and equipment that may be required to complete these procedures is provided in Table 6-3.

6.3 Data Processing, Evaluation, and Management

The data collected to support the air monitoring event will be stored in the project files. Analytical data will be validated in accordance with QAPP (Anchor QEA 2011b) Worksheets #12 (Measurement Performance Criteria), #35 (Sampling and Analysis Validation [Steps IIa and IIb] Process Table), #36 (Sampling and Analysis Validation [Steps IIa and IIb] Summary Table), and #37 (Data Usability Assessment). Analytical data will be maintained in the project database and accessible only by designated project personnel as described in the DMP (Anchor QEA 2011c).

Air monitoring data collected during the Phase 1 RI Field Program will be used in conjunction with available regional data to evaluate baseline conditions of air quality in the Study Area and potential contributions from the Study Area. Specific details on the data evaluation process will be discussed with USEPA prior to sampling.

6.4 Reporting

Following data validation and review, air monitoring data collected during the Phase 1 RI Field Program will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

6.5 Schedule

Anchor QEA anticipates further evaluation and review of available background regional air quality and meteorological data and will discuss and finalize the air monitoring program with USEPA in advance of sample collection. The ambient air monitoring is intended to be conducted during a period when wind direction is generally perpendicular to the Study Area, as described above. A representative day will be selected in collaboration with USEPA based upon a more detailed site-specific evaluation of weather conditions and prevailing winds.

The air monitoring described in this section will be conducted over a 24-hour period. It is anticipated that at minimum 3 months will be required for mobilization, to identify sample locations, and to obtain site access. Site access considerations may expand the time of this mobilization period. The schedule will also be dependent on weather and field conditions.

Table 6-1
Air Monitoring Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses
	Easting	Northing			
Block2525 Lot1	998692.5803	205559.8659	South of Newtown Creek and Whale Creek	- Upwind of the Study Area based on prevailing wind direction - Provide Study Area background conditions - Within manufacturing-zoned area	PCBs and VOCs
Block69Lot14	999490.9273	209406	North of Newtown Creek and West of Dutch Kills	- Downwind of the Study Area based on prevailing wind direction - provide Study Area background conditions - Within manufacturing-zoned area	PCBs and VOCs
Block2660 Lot50	1000984.856	203865.0062	South of Newtown Creek, West of English Kills	- Upwind of the Study Area based on prevailing wind direction - Provide Study Area background conditions	PCBs and VOCs
Block303 Lot25	1002001.045	207413.6509	North of Newtown Creek, East of Dutch Kills	- Downwind of the Study Area based on prevailing wind direction - Provide Study Area background conditions	PCBs and VOCs
Block2979 Lot24	1005793.408	198500.4879	South of East Branch and East of English Kills	- Upwind of the Study Area based on prevailing wind direction - Provide Study Area background conditions	PCBs and VOCs
DK012	1000869.741	209293.5418	Dutch Kills, Upper Reach	- Spatially along Study Area - At headwater of tributary near area where sediment loading is occurring - Upwind of Study Area, paired with downwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
DK013	1000817.246	209587.949	Dutch Kills, Upper Reach	- Spatially along Study Area - At headwater of tributary near area where sediment loading is occurring - Downwind of Study Area, paired with upwind sample to evaluate potential contribution from Study Area	PCBs and VOCs

Table 6-1
Air Monitoring Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses
	Easting	Northing			
EB012	1005453.069	200175.0733	East Branch, Middle Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Downwind of Study Area, paired with upwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
EB013	1005371.007	199911.4577	East Branch, Middle Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Upwind of Study Area, paired with downwind sample to evaluate contribution from Study Area	PCBs and VOCs
EK024	1003920.202	200774.9148	English Kills, Lower Reach	- Spatially along Study Area - Evaluate potential source/presence of PCBs - Downwind of Study Area, paired with upwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
EK025	1004047.493	200383.9638	English Kills, Lower Reach	- Spatially along Study Area - Evaluate potential source/presence of PCBs - Upwind of Study Area, paired with downwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
EK026	1003178.821	198194.4737	English Kills, Upper Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Evaluate potential source/presence of PCBs - Upwind of Study Area, paired with downwind and within Study Area sample to evaluate potential contribution from Study Area	PCBs and VOCs

Table 6-1
Air Monitoring Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses
	Easting	Northing			
EK027	1003297.056	198348.3896	English Kills, Upper Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Evaluate potential source/presence of PCBs - Within Study Area, paired with upwind and downwind samples to evaluate potential contribution	PCBs and VOCs
EK028	1003343.411	198452.2967	Near Shoreline of English Kills, Upper Reach	- Spatially along Study Area - At headwater of tributary where sediment loading is occurring - Evaluate potential source/presence of PCBs - Downwind of Study Area, paired with upwind and	PCBs and VOCs
MC009	1005862.502	202887.3073	Maspeth Creek, Upper Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Upwind of Study Area, paired with downwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
MC010	1005663.466	203167.8743	Maspeth Creek, Upper Reach	- Spatially along Study Area - Near headwater of tributary where sediment loading is occurring - Downwind of Study Area, paired with upwind sample to evaluate potential contribution from Study Area	PCBs and VOCs
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	- Spatially along Study Area - At mouth Newtown Creek	PCBs and VOCs
NC083	996691.797	208593.7429	Newtown Creek, Lower Reach	- Spatially along Study Area - Near pubic access point at Manhattan Avenue - Upwind of Study Area, paired with downwind and within Study Area samples to evaluate potential	PCBs and VOCs

Table 6-1
Air Monitoring Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses
	Easting	Northing			
NC084	996688.8884	208676.9532	Channel of Newtown Creek, Lower Reach	- Spatially along Study Area - Near pubic access point at Manhattan Avenue - Within Study Area, paired with upwind and downwind Study Area samples to evaluate potential	PCBs and VOCs
NC085	996688.9783	208753.4406	Newtown Creek, Lower Reach	- Spatially along Study Area - Near pubic access point at Manhattan Avenue - Downwind of Study Area, paired with upwind and within Study Area samples to evaluate potential	PCBs and VOCs
NC086	999063.4298	207717.1223	Newtown Creek at Whale Creek	- Spatially along Study Area - Within Study Area, paired with downwind Study Area sample to evaluate potential contribution from Study	PCBs and VOCs
NC087	999020.7536	208186.7084	Newtown Creek at Dutch Kills	- Spatially along Study Area - Downwind of Study Area, paired with upwind Study Area sample to evaluate potential contribution from	PCBs and VOCs
NC088	1002556.854	204587.9153	Newtown Creek, Middle Reach	- Spatially along Study Area - On Respondents property - Upwind of Study Area, paired with downwind and within Study Area samples to evaluate potential	PCBs and VOCs
NC089	1002531.049	204718.748	Channel of Newtown Creek, Middle Reach	- Spatially along Study Area - Adjacent to Respondents property - Within Study Area, paired with upwind and downwind Study Area samples to evaluate potential contribution from Study Area	PCBs and VOCs
NC090	1002461.76	204954.2754	Newtown Creek, Middle Reach	- Spatially along Study Area - Adjacent to Respondents property - Downwind of Study Area, paired with upwind and within Study Area samples to evaluate potential	PCBs and VOCs

Table 6-1
Air Monitoring Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses
	Easting	Northing			
NC091	1003832.506	204226.6157	Newtown Creek, Upper Reach	- Spatially along Study Area - On Respondents property - Upwind of Study Area, paired with downwind and within Study Area samples to evaluate potential	PCBs and VOCs
NC092	1003899.311	204619.347	Newtown Creek, Upper Reach	- Spatially along Study Area - Near location of potential future public access to Study Area at new Kosciuscko Bridge - Within Study Area, paired with upwind Study Area sample to evaluate potential contribution from Study	PCBs and VOCs
NC093	1004708.269	203067.1087	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	- Spatially along Study Area - Adjacent to Respondents property - Evaluate potential source/presence of PCBs - Within Study Area	PCBs and VOCs
NC094	1005173.498	201512.3991	Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	- Spatially along Study Area - Near location of potential future public access to Study Area - Evaluate potential source/presence of PCBs - Within Study Area	PCBs and VOCs

Notes:

1 - Sampling locations are approximate and may be modified based on field conditions, access issues, etc.

2 - See Table 6-2 for further information on analytes.

AA = Ambient Air

NAD = North American Datum

Table 6-2
Air Monitoring Analytes, Sample Containers, and Laboratories for Analysis

Matrix	Analytical Group	Minimal Volume	Container	Preservation Requirements	Lab	Number of Locations
Air	Volatile Organics	6 L	SUMMA canister	Protect from temperature extremes	Alpha Analytical 320 Forbes Boulevard Mansfield, MA 02048 Cindy McQueen 508.844.4120	29
Air	PCB Aroclors	1 to 5 L	PUF Sorbent Cartridge; wrap in aluminum foil in glass jar	≤ 4 ° C; protect from light	Alpha Analytical 320 Forbes Boulevard Mansfield, MA 02048 Cindy McQueen 508.844.4120	29

Table 6-3

Air Monitoring Materials and Equipment

- 7-micron particulate filter for each SUMMA canister if not built into the flow controller
- 32 pre-cleaned and evacuated, batch certified SUMMA canisters
- Air Monitoring instruments and manuals (Photoionization detector [PID], multi-gas detector, and calibration supplies)
- Air Sampling Forms
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Booms
- Bound, waterproof field logbooks
- Cell phone
- COC forms (electronic)
- Clear plastic shipping tape
- Clipboard
- Continuous-Flow Sampling Pump: The pump should provide a constant air flow (<±5%), be quiet and unobtrusive, with a flow rate of 1 to 5 L/min
- Custody tape or seals
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital camera
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)

Table 6-3
Air Monitoring Materials and Equipment

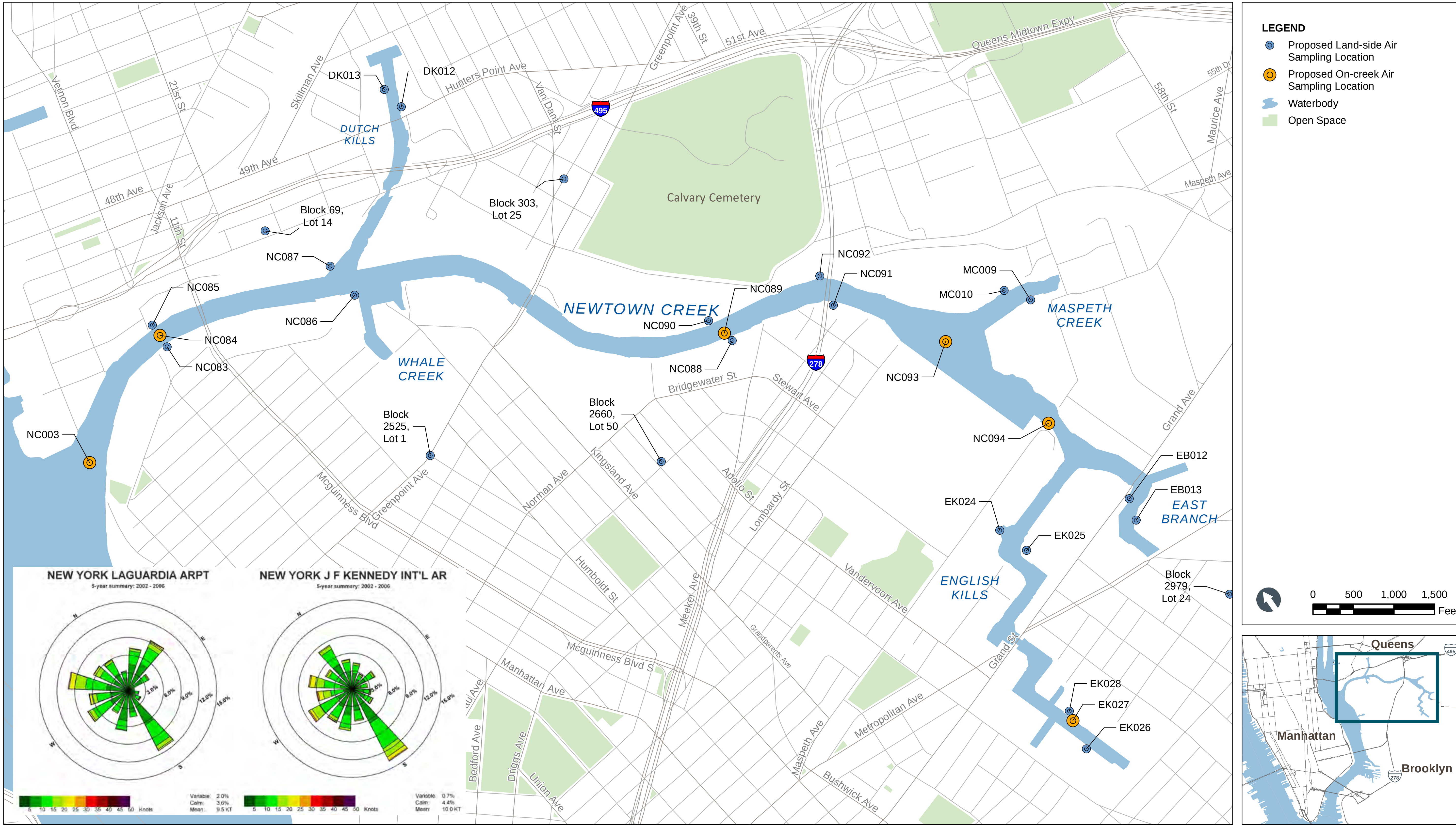
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Flexible Teflon tubing Tygon® piece at each end to connect to pump
- Flow controller for each SUMMA canister
- Hand-held electronic recording device (optional)
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Latex or pre-cleaned cotton gloves
- Marine VHF (high frequency) radio
- Navigation charts (electronic)
- Overnight courier airbills or shipping forms
- Particle Filter
- Pre-determined sampling coordinates/waypoints and locations figure
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Sample labels
- Sampling cartridge for Polychlorinated Biphenyls (PCBs)
- Sealing tape
- Sealable (Ziploc) plastic bags
- Shipping tape
- PUF cylinders
- Standardized field data forms (hard copy and/or electronic)
- Study Area maps
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Tubing (chromatic-grade stainless steel) and fittings (chromatic-grade, ¼ inch Swagelok)
- Vacuum gauge for each SUMMA canister if not built into the valve mechanism
- Valve and inlet cap for each SUMMA canister
- Wet ice and coolers
- Wrenches (fittings require 9/16 inch open wrenches)

See the following SOPs for further details:

Table 6-3

Air Monitoring Materials and Equipment

- NC-01 Field Records
- NC-04 Navigation/Boat Positioning
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-20 Air Monitoring for PCBs
- NC-21 Air Monitoring for Volatile Organic Compounds (VOCs)



Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 6-1
Proposed Air Sampling Locations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 6-1 Proposed Air Sampling Locations.mxd lhudson 10/14/2011 3:20:18 PM

7 SURFACE SEDIMENT SAMPLING

This section describes the procedures that will be followed to perform the surface sediment sampling activities. Section 8 describes the procedures that will be followed to perform the subsurface sediment sampling activities. Sedflume procedures are provided in Section 9. Each of these sediment sampling activities may be conducted using different equipment and/or during separate mobilizations. The scope development activities for this work are provided in the QAPP (Anchor QEA 2011b)

7.1 Overview

Purpose. Surface sediment sampling will be conducted along the length of the Study Area and its tributaries to meet the following objectives:

1. Characterize the physical properties and chemical nature of sediments along the length of the Study Area
2. Provide data for the evaluation of human health risks related to complete exposure pathways identified for surface sediments
3. Establish a list of COPCs in Study Area sediments based on their potential contribution to risk to the environment and human health
4. Determine and evaluate the constituents within the Biologically Active Zone (BAZ) of surface sediments in the Study Area
5. Provide data for the SLERA and a foundation for development of the BERA evaluation
6. Characterize the potential for future natural recovery, using geochronology/radioisotope analyses (beryllium-7 [^{7}Be])[2], grain size, total organic carbon (TOC), and percent moisture distribution of surface sediment samples
7. Collect geotechnical and other physical data to support the evaluation of potential remedial alternatives

[2] ^{7}Be radioisotope analysis will be performed on surface sediment samples only. Lead-210 (^{210}Pb) and Cesium-137 (^{137}Cs) radioisotope analysis will be performed on subsurface samples only.

The Study Area has been dredged along its entire length at some time during its history. In consideration of this history, for the purpose of this RI/FS, sediments are defined as the deposits that occur above the native materials.

Existing Data Review. Several sediment studies have been performed in the Study Area. Initial investigations of sediment quality conditions in the Study Area were conducted between 1985 and 2000. A 1993 investigation of the Newtown Creek sediments next to the Laurel Hill facility showed that the sediments contained concentrations of organic compounds (primarily polycyclic aromatic hydrocarbons [PAHs]) and metals at levels above NYSDEC sediment screening criteria. Sediment analyses included metals, PAHs, PCBs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), pesticides, dioxins and furans, VOCs, total solids, TOC, and grain size.

In 1990 and 2000, NYCDEP and NYSDEC collected sediment samples from locations throughout the Study Area. A wide range of metals, including arsenic, cadmium, chromium, copper, and mercury, were detected in surface (0 to 0.33 foot [0 to 10 centimeters (cm)] below the mudline) sediment samples at concentrations that exceed NOAA effects range screening levels for potential benthic toxicity.

As part of the investigations of sediments in the Study Area during the OU6 (Laurel Hill facility) RI (2004 and 2005), surface and subsurface sediment samples were collected for a variety of analyses including bulk chemistry, bioavailability, and geochronology. These analyses showed the presence of a wide range of metals, hydrocarbons (including PAHs), PCBs, pesticides, plasticizers (e.g., phthalates), and other constituents.

Based on the results of the 2009 Environmental Site Inspection (ESI), USEPA concluded that metals, VOCs, SVOCs including PAHs, and PCBs are present in Study Area sediments at concentrations above the background concentrations established for the ESI. The data showed that constituents above ESI background were not confined to any particular area, but were present throughout the Study Area, from the navigable portion of English Kills to the mouth of Newtown Creek. Additionally, the ESI concluded that the variety and distribution of the detected constituents suggested a variety of sources.

The NYCDEP pre-dredging sediment sampling in 2009 showed the presence of metals, PAHs, PCBs, dioxins, pesticides, and VOCs.

Data Gap Assessment Relative to CSM. A comprehensive analysis of sediment chemistry, geotechnical properties, stability, and transport has not been conducted of the entire Study Area. Each of these components is necessary to complete the CSM.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed through obtaining and evaluating existing data as part of the Historical Data Review and by conducting additional sediment sampling and related analyses.

The following activities are included in the sediment sampling:

- Surface sediment physical and chemical sampling (Section 7)
- Benthic macroinvertebrate community survey sampling (surface sediment samples will be taken at benthic survey locations; Sections 7 and 12)
- Subsurface sediment physical and chemical sampling (Section 8)
- Sediment Stability and Transport:
  - Sediment geochronology measurements (Sections 7 and 8)
  - Sedflume testing (Section 9)

Surface sediment stations will be sampled for a designated list of parameters as discussed in Table 7-1, which provides the sampling stations, rationale for each station, and analytes/analyte groups for each station. Figure 7-1 shows the proposed surface sediment sampling stations; Figure 7-2 shows the geochronology/radioisotope stations; Figure 7-3 shows the stations for the select chemical analyses (dioxins-furans, pesticides, PCB congeners, and methyl mercury); and Figure 7-4 shows the stations for geotechnical analysis. These stations may be adjusted based on the results of the identification of potential submerged utilities, utility crossings, or other hazards within the Study Area; bathymetric, side-scan sonar, and magnetic surveys; shoreline assessment; or field conditions. If a station needs to be moved more than 200 feet parallel to the shoreline and/or 50 feet perpendicular to the shoreline, USEPA will be notified prior to sampling. A log of the rationale for significantly moving any station will be maintained and included in the monthly status reports submitted to USEPA.

7.2 Procedures

Sediment sampling and processing activities for the collection of surface samples are described in the following sections. All of the tasks described in this section will be documented, and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c). Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for a sample form) and on data collection forms (see SOP NC-05 – Sediment Grab Sampling for sample form). Photographs will be taken of the surface sediment and any significant observations made during sampling.

Surface sediment samples will be collected from 0 to 0.5 feet (0 to 15 cm) below the sediment surface or mudline. The surface mudline is defined as the interface between bulk sediments and overlying surface water. This sampling depth is consistent with the typical depth for the BAZ in the New York-New Jersey Harbor tidal areas. However, it exceeds the typical depth of the BAZ (0 to 10 cm) sampled in coastal sediments (USEPA 2001, 2003). It also exceeds the burrowing depth of the benthic organisms observed in the Study Area during sampling conducted by NYCDEP (NYCDEP 2007) and the burrowing depth of benthic organisms observed in the Study Area during sampling conducted at OU6 (Anchor 2007).

Surface sediment samples will also be collected for the benthic macroinvertebrate community survey. Collection and processing procedures for the benthic samples are discussed in Section 12 – Ecological Resource Characterization.

Surface sediment samples will be collected using an Eckman sampler, modified Eckman sampler, a modified Van Veen sampler, or a Petit Ponar sampler, or similar sampling device as appropriate for the type of sediment sample being collected (refer to SOP NC-05 - Sediment Grab Sampling). The Eckman sampler is the preferred sampler and the other samplers will be used only if the Eckman sampling cannot collect a representative surface sediment sample. If a grab sampling technique is unsuccessful at collecting a surface sediment sample, other techniques including collecting the sample by advancing a box corer or sediment core will be considered. The procedure for collecting a core sample is presented in Section 8. The surface sediment samples will be collected using the following procedures and in accordance with the referenced SOPs.

The type of sampler will be selected according to use (ecological versus chemical samples) and other types of samplers will be used only if field conditions require. However, consideration will be given to sampling consistently and not changing techniques without consideration of the potential impact on the comparability of sample results. A 0.05 m^2 Eckman sampler is the preferred device for chemical and benthic invertebrate sample collection, except where this device is unable to collect a sample. In these instances an alternative grab sampler such as a van Veen will be used and benthic invertebrate data will be treated appropriately when used comparatively.

Sufficient surface sediment will be collected to fill the required analytical bottles for the sample station, including split samples, if requested by USEPA. Table 7-2 includes a summary of the sample containers required for each analyte. In addition, an archive sample will be collected from each station for potential future chemical and supplemental analyses.

Surface sediment samples will be collected from the mouth of Newtown Creek to the headwaters, which, based on available data, will generally be from the areas of the least sediment contamination to areas of the more sediment contamination. When possible, each location in a transect will be sampled prior to moving to the next transect. If access to a location or locations is not possible due to anchored vessels or other issues, an attempt will be made to revisit the location, if applicable, or select an alternate location.

During surface sediment sampling and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (e.g., fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (e.g., sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

In addition, during the surface sediment sampling and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

7.2.1 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating sediment sampling. These activities are summarized below:

- Ensuring that required permits and notifications for the type of sampling and sampling stations within the Study Area have been submitted and approved for the day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the hydrographic surveys
- Obtaining utility locations for the sampling period and area within the Study Area and ensuring that all utility crossings have been identified (see Section 3) and relocating any station that is within 30 feet vertically or 50 feet horizontally from any utilities or related infrastructure.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides and equipment required for sampling. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A medium-sized boat is proposed for surface sediment sampling activities, but a small-sized boat may be necessary for some portions of the Study Area. These areas include Dutch Kills where access is limited by fixed bridge clearance, tributary headwaters where floatables containment booms may limit access, and areas where sediment accumulation may limit access.

- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions the day prior to leaving the dock and throughout the day for changing conditions.
- Calibration of the multi-gas meter and hydrogen sulfide (H_2S) meter for use on board the boat.
- Obtaining final sample table from Project Chemist that will be compiled for each sampling mobilization and organized by station. This table will include station number, analyses to be conducted, QA/QC samples required, holding times, preservation, and laboratory address. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.
- Preparation of a daily float plan listing a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, access points along the Study Area, and sample transfer/transport locations. Target coordinates will be pre-loaded into a DGPS unit.
- Checking that water level pressure transducers are working properly.

7.2.2 Sampling Activities

It is anticipated that the boat crew for surface sediment grab sampling activities will consist of about four field staff including a boat captain and three crew members, support boat, staffed by a boat captain and a field team staff member and capable of transporting sample containers and collected samples (under COC), will be available in the event the sampling boat cannot accommodate the number of sample containers required for the day. The boat crew will be in constant communication with the Field Team Leader during sampling activities. The boat and crew will meet health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the surface sediment sampling, the designated field team staff will check with the Field Team Leader to confirm the schedule and stations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for surface sediment sample collection:

- Load all pre-cleaned sampling equipment and required sample containers on the boat, include decontamination fluids/equipment and IDW containers, and place fresh ice in sample holding containers. Should the sampling boat be of insufficient size to accommodate the required sample containers, a support boat will be used to transport containers and collected samples (under COC) as necessary. Additional sample containers will be available for opportunistic sample collection (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).
- Navigate the boat to the target sample station. The boat will be positioned at the target sample station using the procedures described in NC-04 – Navigation and Boat Positioning. For surface sediment sampling, care will be taken to place anchors at a distance where they will not cause disturbance of potentially contaminated sediments in the vicinity of the designated sampling station. An electric motor will be used to stabilize the boat on station as necessary. If additional grab samples are required, the boat will be slightly relocated to obtain the sample using the procedures described in NC-04 - Navigation and Boat Positioning.
- Survey coordinates (horizontal datum in NAD83 using NYLI) will be recorded for each sample attempt on the Sediment Grab Collection Record included in SOP NC-05 – Sediment Grab Sampling. Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy, or equivalent equipment.
- Surface sediment samples will be collected at each station using an Eckman sampler, or similar sampling device as appropriate for the type of sediment being sampled. Surface sediment grab sampling procedures are detailed in SOP NC-05 – Sediment Grab Sampling.
- Once the boat is in position, the sampler will be lowered with the winch to the sediment surface/mudline and allowed to penetrate into the sediments. The messenger will then be released to trigger the collection of the surface sediment sample. Following release of the messenger, the boat's position will be recorded.

- The sampler will be raised slowly to prohibit washing of the sediment from the sampler.
  - Once the surface sediment grab sample is retrieved, evaluate whether the sample is acceptable to be retained for processing (i.e., sediment penetration depth is adequate and there are no signs of washout or channeling of the sediment surface) per SOP NC-05 – Sediment Grab Sampling. If acceptable, the surface sediment grab sample will be retained for sample collection. At some stations several attempts may be required to obtain acceptable surface sediment volume. The sampling equipment will not be decontaminated between discrete samples. At each sampling station, sufficient volume will be collected for chemical, geochronology, physical, and archive analysis. If multiple attempts are required to attain adequate volume, the grabs will be composited then homogenized prior to filling sample jars.
  - At each of the benthic macroinvertebrate community survey sampling stations, three discrete grab samples will be collected for the benthic survey (see Section 12 and NC-22 – Benthic Community Survey) using an Eckman sampler that has a penetration depth of approximately 15 cm and a surface area of approximately $0.25m^2$.
- The surface sediment samples will be processed into sample containers on the boat and then placed on ice pending transport to the sample processing area where the samples will be packed for shipping. Sample processing is described below.
- Material in unacceptable grabs, decontamination fluids, and spent PPE will be containerized as IDW. The decontamination fluids will be containerized separately. IDW will be transferred to the field facility, and disposed of according to SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.
- Equipment will be cleaned and decontaminated between sampling stations per SOP NC-02 – Equipment Decontamination.
- All field activities will be documented including surface sample collection and custody transfer of the samples. The Surface Sediment Grab Log (example form in SOP NC-05 – Sediment Grab Sampling) will be filled out in its entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records. Survey data and field records/forms will be reviewed by the Field Team

Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files.

- At the end of the day and between each station, all sampling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination.

7.2.3 Sample Processing

Surface sediment samples will be processed on the boat. Sample processing procedures for chemical and physical characterization are presented below. Sampling nomenclature is presented in Section 14.2.1 and sample analysis is discussed in Section 7.2.6.

- Screen sample with PID. Record PID readings on grab sample form.
- To minimize the loss of volatiles, the sample for VOC analysis will be collected immediately following grab acceptance and prior to sample characterization. Subsample material will be collected from representative portions along the entire depth of the sampling interval in the grab and transferred directly into a 2-oz glass sample jar and filled completely allowing no headspace. If more than one grab is required to obtain acceptable surface sediment volume, VOC subsample material will be obtained from the first grab collected as described in SOP NC-05-Sediment Grab Sampling.
- Discrete samples for analyses other than VOCs that cannot be composited (geochronology/radioisotopes [^{7}Be], sulfide, and methyl mercury) will be collected directly from center of the sampler without contacting the sides of the sampler as described in SOP NC-05 - Sediment Grab Sampling. The geochronology/radioisotope samples will be collected from the top 3½ centimeters at designated stations. Once discrete samples are collected, the remainder of the sample interval (or material in additional grab sample attempts) will be retained for additional processing as required, photographing, and material description using procedures detailed in SOP NC-05 – Sediment Grab Sampling.
- Sediments in each grab sample will be classified using the Unified Soil Classification System (USCS) and information recorded on a lithology record to include primary grain size, minor constituents, color, consistency, odors, and visible evidence of impacts (e.g., sheen), debris (glass, nail, etc.) and presence or absence of benthic

macroinvertebrates.

- A photographic log will be kept of each grab sample. For each sample, a representative photograph will be taken with a place card of the sample location and sample interval, date, and a ruler will be visible in the photograph.
- Sediment will be composited and samples will be placed in the appropriate laboratory-provided sample containers.
- An archive sample for future analysis for chemical and supplemental parameters will be collected from each station.
- Samples will be transferred from the sample custodian on the boat to a sample custodian on the shore from the field facility using procedures per SOP NC-13 – Sample Custody. Once samples are received at the field facility, the samples will be checked and information will be entered onto a COC Record for transport to the laboratory per SOP NC-13 Sample Custody. Sample containers will be stored at 4 degrees Celsius (°C) pending shipment to the laboratory per SOP NC-14 – Sampling Packaging and Shipping. Sample handling and shipping procedures are discussed in Section 14.2. All field activities will be documented, including sample processing procedures, sample collection and COC, and shipment to the laboratories. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records. Field records/forms will be downloaded to a field facility computer as possible and this information will be forwarded to the Data Management Task Manager.

At the end of the day and between stations, all processing equipment will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next day or at the next station.

7.2.4 Sample Station and Frequency

Sample stations are shown in Figures 7-1 to 7-4. The Phase 1 RI Field Program includes one round of surface sediment sampling for general chemical and physical analysis and two rounds of surface sediment sampling for benthic surveys.

7.2.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. The nomenclature that will be used is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 7-1 to 7-4. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - GC = Geochron sediment
  - SG = Sediment grab
  - SW = Surface water
  - RB = Rinsate blank
  - TB = Trip blank
- Depth: Sediment samples = 6-character identifier indicating the depth in centimeters from where the samples were collected.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A surface grab sample collected at the 26th station of the main Newtown Creek area with a depth of 0 to 15 cm collected on September 8, 2011 would have the id:

NC026SG-000015-20110908

- The duplicate of this sample would have the id: NC1026SG-000015-20110908
- A sediment grab collected at the 5th station of the Dutch Kills area with a depth of 0 to 15 cm collected April 27, 2012 would have the id: DK005SG-000015-20120427
- A rinsate blank collected in association with sediment grab sampling collected on June 1, 2012 would have the id: SG-RB-20120601

7.2.6 Sample Handling and Analysis

Surface sediment samples will be analyzed for a broad list of constituents identified in the RI/FS Work Plan Table 4-4 (AECOM 2011) and summarized by analysis in Table 7-1 in this FSAP and in QAPP (Anchor QEA 2011b) Worksheet #20 (Field Quality Control Sample Summary Table). Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Table 7-2 provides the list of analyses, containers, sample size, and laboratory information. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

7.2.7 Equipment Decontamination

Surface sediment sampling equipment will be in contact with site media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

7.2.8 Investigation-Derived Waste

IDW will be generated during the performance of the surface sediment sampling and during equipment decontamination. Cleaning and decontamination of equipment will be conducted between sampling locations. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

7.2.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records

- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-05 – Sediment Grab Sampling
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation
- NC-22 – Benthic Community Survey

7.2.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 7-3.

7.3 Data Processing, Analysis, and Management

Data collection records from the surface sediment sampling activities, including sample collection, processing, and sample management, will be downloaded as possible and saved to the project files. Paper records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

Analytical data will be validated as described in the QAPP (Anchor QEA 2011b). Analytical data will be maintained the project database and accessible only by designated project personnel as described in the DMP (Anchor QEA 2011c).

7.4 Reporting

Information obtained during sediment sampling and processing activities for sediment chemistry and physical characterization, geochronology measurements, ecological assessment, and stability evaluation will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate as described in Section 3.0 of the RI/FS Work Plan.

7.5 Schedule

Phase 1 RI surface sediment sampling activities are planned to be conducted over two, and possibly three, mobilizations. The schedule will be dependent on weather and field conditions. The anticipated order of sampling activities is provided below.

Mobilization 1 – Surface sediment sampling for chemical and physical parameters. It is anticipated that one round of benthic macroinvertebrate community survey sampling will be conducted during this mobilization. If this sampling does not occur during a high DO (spring) or low DO (late summer) period, the macroinvertebrate community survey sampling will be conducted during a separate mobilization. DO levels will be measured during surface water sampling rounds (see Section 10) and compared with published information to confirm low and high DO periods.

Mobilization 2 – Round of benthic macroinvertebrate community survey sediment (grab) sampling. This event will be conducted during a high or low DO period. If benthic macroinvertebrate community survey sampling was conducted during Mobilization 1, then this sampling will be conducted during the alternate DO condition, e.g., if Mobilization 1 was during a high DO period, then this mobilization will be scheduled during a low DO period. If benthic macroinvertebrate community survey sampling does not occur during Mobilization 1, then this sampling round may be scheduled for either a high or low DO period, whichever comes first following the initiation of Phase 1 RI field work.

Mobilization 3 – Second round of benthic macroinvertebrate community survey sediment (grab) sampling (if necessary). If the benthic macroinvertebrate community survey sediment (grab) sampling cannot be conducted during Mobilization 1, then this third mobilization will be required to collect the second round of these samples. This sampling event will be conducted during a high or low DO period. This sampling will be conducted during the alternate DO condition from that of the Mobilization 2 sampling, e.g., if the Mobilization 2 sampling was conducted during a high DO period, then this mobilization will be scheduled during a low DO period.

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
DK002	999110.0532	208137.1781	Dutch Kills at Confluence with Newtown Creek	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
DK003	999481.543	208192.6929	Dutch Kills, Lower Reach, Near Confluence with Newtown Creek	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location where sediment loading is occurring - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) Surface Sediment Sample - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
DK004	1000012.844	208454.282	Dutch Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading	1	SS = Surface Chemical-All List
DK005	1000111.291	208508.0233	Dutch Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading Geotechnical Sample - Spatially along Study Area Geochronology Sample - Spatially along Study Area - In area of potential sediment loading Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geotechnical List, and Geochronology List
DK006	1000201.944	208594.8129	Dutch Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
DK007	1000545.082	208859.9856	Dutch Kills, Middle Reach	Benthic Sample - Spatially along Study Area - Mid-way within tributary - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Upstream of stormwater outfall - Near location where sediment loading is occurring Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
DK008	1000701.698	209137.1112	Dutch Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, in location where sediment loading is occurring	1	SS = Surface Chemical-All List
DK009	1000747.285	209246.1498	Dutch Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, near area where sediment loading is occurring	1	SS = Surface Chemical-All List
DK010	1000800.173	209354.2984	Dutch Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, near area where sediment loading is occurring	1	SS = Surface Chemical-All List
DK011	1001089.061	209964.0173	Head of Dutch Kills	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) - At location of potential sediment loading Surface Sediment Sample - Spatially along Study Area - Near head of tributary where sediment loading is occurring - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Geotechnical List, and Surface Chemical-Select List
EB001	1005511.352	200541.6285	Near Shoreline of East Branch, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
	Easting	Northing				
EB002	1005582.6	200571.3785	Channel of East Branch, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EB003	1005652.413	200598.6722	Near Shoreline of East Branch, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EB004	1005890.647	200201.5561	East Branch, Side Channel	Surface Sediment Sample - Spatially along Study Area - Near head of tributary where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List
EB005	1006181.067	200119.2434	East Branch, Head of Side Channel	Surface Sediment Sample - Spatially along Study Area - At core location - At head of tributary where sediment loading is occurring Geotechnical Sample - Spatially along Study Area Geochronology Sample - Spatially along Study Area - At head of tributary where sediment loading is occurring Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geotechnical List, and Geochronology List
EB006	1005616.345	200206.3613	At Fork in East Branch	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At bend in waterbody; location where deposition may occur Surface Sediment Sample - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Geotechnical List, and Surface Chemical-Select List
EB007	1005394.226	200068.4344	Channel of East Branch, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
EB008	1005175.831	199867.5134	Channel of East Branch, Upper Reach, Near Head of East Branch	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location of potential sediment loading - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
EB009	1005223.691	199662.0581	Channel of East Branch, Upper Reach, Near Head of East Branch	Surface Sediment Sample - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List
EB010	1005320.943	199517.815	Head of East Branch	Surface Sediment Sample - Spatially along Study Area - At head of tributary where potential sediment loading is occurring - At core location Geochronology Sample - Spatially along Study Area - At head of tributary where sediment loading is occurring Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geochronology List, and Geotechnical List
EK001	1004694.205	200884.3791	Near Shoreline of English Kills, Lower Reach, Near Confluence with East Branch and Newtown Creek	Benthic Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
EK002	1004719.791	200818.7878	Channel of English Kills, Lower Reach, Near Confluence with East Branch and Newtown Creek	Benthic Sample - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks, associated with samples outside of dredged channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
	Easting	Northing				
EK003	1004471.493	200749.5603	Channel of English Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK004	1003920.202	200774.9148	Near Shoreline of English Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Near upland property - Near area where a sheen has been observed - At core location Geotechnical Sample - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Geotechnical List, and Surface Chemical-Select List
EK005	1004047.493	200383.9638	Near Shoreline of English Kills, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Near area where a sheen has been observed - At core location	1	SS = Surface Chemical-All List
EK007	1003606.979	199953.3351	Near shoreline of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK008	1003625.762	199895.9735	Channel of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK009	1003655.319	199831.921	Near Shoreline of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
EK010	1003180.411	199770.0307	Near Shoreline of English Kills, Middle Reach	Benthic Sample - Spatially along Study Area - Outside of dredged channel where potential impact from shipping traffic expected to be lower - In potential depositional area Surface Sediment Sample - Spatially along Study Area - In potential depositional area - At core location - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Geotechnical List, and Surface Chemical-Select List
EK011	1003281.971	199219.2877	Near Shoreline of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK012	1003380.078	199166.4839	Channel of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK013	1003483.518	199109.9468	Near Shoreline of English Kills, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
EK015	1003012.848	198821.8218	Channel of English Kills, Upper Reach	Surface Sediment Sample - At core location - Adjacent to upland site	1	SS = Surface Chemical-All List
EK016	1003166.522	198584.7066	Channel of English Kills, Upper Reach	Benthic Sample - Spatially along Study Area - Downstream of stormwater outfall Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
EK017	1002862.736	198386.7308	Channel of English Kills, Upper Reach	Sediment Core - Near head of tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List
EK018	1003256.195	198140.5522	Near Shoreline of English Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
EK019	1003308.988	198159.208	Channel of English Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - At core location Geotechnical Sample - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Geotechnical List, and Surface Chemical-Select List
EK020	1003358.048	198172.532	Near Shoreline of English Kills, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List
EK021	1003415.709	197812.1642	Channel Near Head of English Kills	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location of potential sediment loading - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) Surface Sediment Sample - At head of tributary where sediment loading is occurring - At core location - Collocated with benthic sample Geochronology Sample - Spatially along Study Area - At headwaters of tributary where higher sediment loading is occurring Geotechnical Sample - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, Geotechnical List, and Geochronology List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
	Easting	Northing				
MC001	1005324.506	203037.0367	Channel of Maspeth Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Near Respondent property - In tributary in area where sediment loading is occurring - At core location Geochronology Sample - In area of higher sediment loading Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geochronology List, and Geotechnical List
MC002	1005531.231	203032.9007	Channel of Maspeth Creek, Middle Reach	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Mid-way up tributary - In area where sediment loading is occurring Surface Sediment Sample - Collocated with benthic sample - Near Respondent property - Near area of potential sediment loading	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
MC003	1005694.578	202945.8248	Near Shoreline of Maspeth Creek, Middle Reach	Surface Sediment Sample - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List
MC004	1005689.039	203021.2564	Channel of Maspeth Creek, Middle Reach	Surface Sediment Sample - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - At core location Geotechnical Sample - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
MC005	1005698.2	203104.2124	Near Shoreline of Maspeth Creek, Middle Reach	Surface Sediment Sample - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
MC006	1005941.059	202987.2962	Channel of Maspeth Creek, Upper Reach, Near Head of Maspeth Creek	Benthic Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - In area where sediment loading is occurring - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) Surface Sediment Sample - Spatially along Study Area - In tributary where sediment loading is occurring - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
MC007	1006124.506	202922.5149	Channel of Maspeth Creek, Upper Reach	Surface Sediment Sample - Near head of tributary where sediment loading is occurring - At core location Geotechnical Sample - Spatially along Study Area Geochronology Sample - Spatially along Study Area - In area of higher sediment loading Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geochronology List, and Geotechnical List
NC001	994787.3689	207874.3064	Mouth of Newtown Creek at Confluence with East River	Surface Sediment Sample - Within proposed NYC dredging area - At core location	1	SS = Surface Chemical-All List
NC002	995253.7507	207780.5987	Near Shoreline of Newtown Creek Near Confluence with East River	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Spatially along Study Area - At core location, outside of dredged channel - Collocated with benthic sample	4	SS = Surface Chemical-All List BM = Benthic Macroinvertebrates

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	Benthic Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Spatially along Study Area - At core location, outside of dredged channel - Collocated with benthic sample Geotechnical Core - Spatially along Study Area Geochronology Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, Geotechnical List, and Geochronology List
NC004	995034.1653	208145.9183	Near Shoreline of Newtown Creek Near Confluence with East River	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Spatially along Study Area - At core location - Within proposed NYC dredging area near mouth of Newtown Creek - Collocated wit benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC005	995426.3033	208136.0479	Channel of Newtown Creek, Lower Reach, Near Confluence with East River	Surface Sediment Sample - Spatially along Study Area - Within proposed NYC dredging area - At core location	1	SS = Surface Chemical-All List
NC006	995768.6078	208203.3587	Near Shoreline of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC007	995680.9649	208329.6693	Channel of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Sample - Spatially along Study Area - Inside navigation channel, paired with samples outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC008	995618.734	208421.268	Near Shoreline of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	1	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC009	996162.7376	208495.6925	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC010	996133.0867	208579.5995	Channel of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC011	996095.8143	208706.7302	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC012	996691.797	208593.7429	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel	1	SS = Surface Chemical-All List
NC013	996688.8884	208676.9532	Channel of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks, associated with samples outside of dredged channel	1	SS = Surface Chemical-All List
NC014	996688.9783	208753.4406	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC015	997102.6275	208557.4293	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC016	997118.7584	208760.8279	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List
NC017	997445.9149	208482.3448	Near Shoreline of Newtown Creek, Lower Reach	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic - Upstream of outfall and Pulaski Bridge Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC018	997483.5541	208583.087	Channel of Newtown Creek, Lower Reach	Benthic Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC019	997484.0762	208674.8245	Near Shoreline of Newtown Creek, Lower Reach	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC021	998037.3837	208269.148	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC022	998071.2981	208371.6912	Channel of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area.	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC023	998099.2788	208465.7602	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC024	998474.9248	208061.1554	Near Shoreline of Newton Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel - At core location	1	SS = Surface Chemical-All List
NC025	998505.0614	208150.5138	Channel of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks, associated with samples outside of dredged channel	1	SS = Surface Chemical-All List
NC026	998544.074	208235.7351	Near Shoreline of Newtown Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC027	999179.0154	207865.0004	Channel of Newtown Creek at Whale Creek/Dutch Kills	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List
NC028	999178.9071	207748.8749	Channel of Newtown Creek at Whale Creek/Dutch Kills	Surface Sediment Sample - Adjacent to proposed NYC dredging area in Whale Creek - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC029	999486.168	207403.7088	Near shoreline of Newtown Creek, Near Whale Creek	Benthic Sample - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel where potential impact from shipping traffic expected to be lower Surface Sediment Sample - Spatially along Study Area - In potential depositional area - At core location - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC030	999861.0965	207446.8157	Near shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC031	999897.5514	207534.9509	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
NC032	999971.2964	207622.2335	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC033	1000267.618	207214.1051	Near Shoreline of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - In location where NYCDEP performed plankton sampling and artificial substrate sampling - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC034	1000311.677	207284.2389	Channel of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - Inside navigation channel, paired with samples outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC035	1000367.443	207363.2247	Near Shoreline of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC036	1000531.995	206848.2136	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC037	1000611.322	206907.0518	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area. Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area.	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC038	1000690.005	206937.7448	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC039	1000683.914	206418.0346	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC040	1000765.176	206444.1619	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC041	1000847.437	206472.968	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC042	1000856.813	205896.3456	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location Geochronology Sample - Adjacent to Respondent property	1	SS = Surface Chemical-All List and Geochronology List
NC043	1000933.579	205937.9131	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC044	1001025.685	205971.7412	Near shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC045	1001119.55	205481.8418	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC046	1001141.355	205537.0667	Channel of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - In transect adjacent to Respondent property - Inside navigation channel, paired with sample outside navigation channel to assess the impact of shipping traffic. - Within NYCDEP fish sampling reach Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC047	1001248.245	205584.1341	Near Shoreline of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - In transect adjacent to Respondent property - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
	Easting	Northing				
NC048	1001490.362	205124.5104	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location Geochronology Sample - Adjacent to Respondent property - Spatially along Study Area Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	SS = Surface Chemical-All List, Surface Chemical-Select List, Geochronology List, and Geotechnical List
NC049	1001554.654	205202.2987	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC050	1001599.007	205279.2285	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC051	1001929.408	204878.7451	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC052	1001960.649	204955.9903	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property	1	SS = Surface Chemical-All List
NC053	1001989.308	205028.5959	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
	Easting	Northing				
NC054	1002431.792	204721.5222	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - In transect adjacent to Respondent property, at core location - Spatially along Study Area - Outside of dredged channel, along transect perpendicular to banks, associated with sample inside of dredged channel. Geochronology Sample - Adjacent to Respondent property, spatially along Study Area. Geotechnical Sample - Spatially along Study Area. Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area.	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geochronology List, and Geotechnical List
NC055	1002459.849	204802.7543	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC056	1002487.906	204883.9864	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC057	1003021.703	204596.6847	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC058	1003056.718	204685.9162	Channel of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - In transect adjacent to Respondent property - Downstream of stormwater outfall - Inside navigation channel, paired with sample outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
	Easting	Northing				
NC059	1003108.572	204767.6328	Near Shoreline of Newtown Creek, Middle Reach	Benthic Sample - Spatially along Study Area - In transect adjacent to Respondent property - Downstream of stormwater outfall - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC060	1003659.146	204427.4841	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC061	1003690.084	204520.1618	Channel of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC062	1003730.106	204609.3855	Near Shoreline of Newtown Creek, Middle Reach	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent property - At core location	1	SS = Surface Chemical-All List
NC063	1004190.52	203890.8764	Near Shoreline of Newtown Creek, Upper Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
NC064	1004273.859	203937.8113	Channel of Newtown Creek, Upper Reach	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC065	1004354.769	203989.2312	Near Shoreline of Newtown Creek, Upper Reach	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC066	1004307.519	203467.7174	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent site - At core location	1	SS = Surface Chemical-All List
NC067	1004478.264	203491.0118	Channel of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent site - At core location	1	SS = Surface Chemical-All List
NC068	1004634.763	203543.5857	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - In transect adjacent to Respondent site - At core location	1	SS = Surface Chemical-All List
NC069	1004468.981	202870.6412	Near Shoreline of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Benthic Sample - Near confluence of Maspeth Creek with Newtown Creek - Near boat turning basin (edges of area may be disturbed) - NYCDEP conducted benthic sampling in area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel where potential impact from shipping traffic expected to be lower. Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area.	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses[3,4]
NC070	1004730.236	202892.8872	Channel of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List
NC071	1004835.206	202964.6631	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Benthic Sample - At confluence of Newtown Creek with Maspeth Creek to evaluate conditions at confluence - Near boat turning basin (edges of area may be disturbed) - Outside navigation channel where potential impact from shipping traffic expected to be lower Surface Sediment Sample - Spatially along Study Area - At core location - Collocated with benthic sample Geotechnical Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC072	1004721.41	202201.9118	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC073	1004879.456	202273.5048	Channel of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List
NC074	1005015.935	202331.4216	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC075	1004837.663	201940.1415	Near Shoreline of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Near end of turning basin - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample. Geotechnical Sample - Spatially along Study Area. Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	5	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List, Surface Chemical-Select List, and Geotechnical List
NC076	1005062.574	201997.2646	Channel of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC077	1005213.768	202034.4408	Near Shoreline of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic - Near area of sediment accumulation Surface Sediment Sample - Collocated with benthic sample	4	BM = Benthic Macroinvertebrates SS = Surface Chemical-All List
NC078	1005132.142	201069.3674	Near Shoreline of Newtown Creek, at Confluence with English Kills and East Branch	Surface Sediment Sample - Spatially along Study Area - At core location	1	SS = Surface Chemical-All List

Table 7-1
Surface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Approximate No. of Grab Deployments[2]	Analyses [3,4]
NC079	1005252.387	200965.302	Channel of Newtown Creek, at Confluence with English Kills and East Branch	Surface Sediment Sample - Spatially along Study Area - At core location Geotechnical Sample - Spatially along Study Area Geochronology Sample - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	2	SS = Surface Chemical-All List, Surface Chemical-Select List, Geotechnical List, and Geochronology List
NC080	1005413.803	200977.574	Near Shoreline of Newtown Creek, at Confluence with English Kills and East Branch	Surface Sediment Sample - Spatially along Study Area - At core location Geochronology Sample - Spatially along Study Area	1	SS = Surface Chemical-All List and Geochronology List
WC002	999093.921	207511.3399	Channel of Whale Creek, Lower Reach	Surface Sediment Sample - Spatially along Study Area - Within proposed NYC dredging area in Whale Creek, at core location.	1	SS = Surface Chemical-All List
WC003	998936.3089	207154.2043	Channel of Whale Creek, Upper Reach	Surface Sediment Sample - Spatially along Study Area - Within proposed dredging area in Whale Creek - At core location	1	SS = Surface Chemical-All List

Notes:
1 - Sampling locations are approximate and may be modified based on field conditions, access issues, etc.
2 - Number of grab deployments per station is approximate and will depend on recovery and sample volume requirements.
3 - Specific analyses that comprise the analyte groups described (SS and BM) are provided in Table 7-2.
4 - Field duplicate samples will be analyzed at a rate of one per twenty project samples (5%) for each matrix and method. MS/MSD samples will be collected at a rate of at least one MS/MSD sample per extraction batch and at least one per twenty samples (5%) for each matrix and method.
BM - Benthic Macroinvertebrate Community Survey Sediment Sample
NAD = North American Datum
SS - Surface Sediment Sample

Table 7-2
Surface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Mass (grams)	Container	Preservation Requirements	Laboratory	Number of Locations	Mass To Specific Labs	Preservative
Surface Sediment Chemical-All List							
Percent Solids	10 grams per each lab (7 labs) = 70 gr	4 oz wide-mouth glass	0-6°C	All Laboratories performing sediment analysis	127	10 grams per each lab (6 labs) = 60 g	0-6°C
PAHs and alkyl PAHs (8270C/D-SIM)	50	8 oz wide-mouth glass	0-6°C/ ≤ -10° C; store in dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	127	50 g	0-6°C/ ≤ -10° C; store in dark
n-Alkanes and Isoprenoids Including DRO and TPH Ranges (8015 Modified)	Included in PAHs/Alkyl PAHs	From PAH/Alkyl PAH jar	0-6°C/ ≤ -10° C; store in dark		127		
TCL VOCs plus TICs (8260B)	40	2-oz jar, no headspace	0-6°C; store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	127	40 g	0-6°C; store in the dark
PIANO VOCs (8260 Modified)	40g	2-oz jar, no headspace	0-6°C; store in the dark		127	40 g	0-6°C; store in the dark
TOC (9060 Modified/Lloyd Kahn)	20	8 oz wide-mouth glass	0-6°C/ ≤ -10° C; store in dark		127	20 g	0-6°C/ ≤ -10° C; store in dark
Ammonia-N (SM4500)	20		0-6°C		127	85 g	0-6°C
Cyanide (9010B)	20				127		
Total Phosphorus (SM4500)	5				127		
pH (9045D)	20				127		
Total Nitrogen (Alpha TKN + NO3/NO2)	10				127		

Table 7-2
Surface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Mass (grams)	Container	Preservation Requirements	Laboratory	Number of Locations	Mass To Specific Labs	Preservative
Soot Carbon (Gustafsson et al., 1997)	10	4 oz wide-mouth amber glass	0-6°C; store in dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	127	10g	0-6°C; store in dark
Sulfide (9030B)	20	2 oz wide-mouth glass	Fill jar completely with sediment; fill the surface with 10N NaOH/ 2N zinc acetate until moistened.; no headspace; ship on ice 0-6°C	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	127	20g	Fill jar completely with sediment; fill the surface with 10N NaOH/ 2N zinc acetate until moistened.; no headspace; ship on ice 0-6°C
TAL Metals plus Tin (6010B/6020)	40	8 oz wide-mouth glass	0-6°C/ ≤ -10° C; store in dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	127/34	40 g	0-6°C/ ≤ -10° C; store in dark
Mercury (1631)	10	From metals jar	≤ -15°C	Brooks Rand Laboratory 3958 6th Ave NW Seattle, WA 98107	127/34	10 g	≤ -15°C
Grain Size (ASTM D442)	100	16 oz wide-mouth glass or HDPE	Ambient	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA	127	200 g	0-6°C
Bulk Density (ASTM D7263-09)	50	4-oz jar	Ambient		127		
TCL SVOCs plus 1,4-Dioxane and TICs (8270C/D)	30	8 oz wide-mouth glass jar	0-6°C/ ≤ -10° C; store in dark	TestAmerica 301 Alpha Drive Pittsburgh, PA 15238	127	120 g	0-6°C/ ≤ -10° C; store in dark
Organochlorine Pesticides (8081A)	30		0-6°C/ ≤ -10° C; store in dark		127		
Chlorinated Herbicides (8151A)	30		0-6°C; store in the dark		127		
TCL PCBs Aroclors (8082)	30		0-6°C; store in the dark		127		
Total Minimal Volume (g)						**695 g**	

Table 7-2
Surface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Mass (grams)	Container	Preservation Requirements	Laboratory	Number of Locations	Mass To Specific Labs	Preservative
Surface Sediment Chemical-Select List							
Methyl Mercury (1630 Modified)	10	2 oz wide-mouth glass	≤ -15°C	Brooks Rand Laboratory 3958 6th Ave NW Seattle, WA 98107	32	10g	≤ -15°C
209 PCB Congeners and Homolog Groups (1668A)	20	8 oz wide-mouth glass	0-6°C/ ≤ -10° C; store in dark	SGS North Americad 5500 Business Drive, Wilmington, NC 28405	32	40	0-6°C/ ≤ -10° C; store in dark
Dioxins and Furans (1613B)	20		0-6°C/ ≤ -10° C; store in dark		32		
Organochlorine Pesticides (HRMS-2/1669)	40	4 oz wide-mouth glass jar	0-6°C/ ≤ -10° C; store in dark	TestAmerica 880 Riverside Parkway West Sacramento, CA 95605	32	40g	0-6°C/ ≤ -10° C; store in dark
Total Minimal Volume (g)						**120 g**	
Surface Sediment Geochronology List							
Radionuclides (Be-7)	100	4 oz wide-mouth glass or plastic	Ambient	Mass Spec Services Division of Geonuclear, Inc. 103 S. Greenbush Rd. Orangeburg, New York	17	100 g	Ambient
Total Minimal Volume (g)						**100 g**	

Table 7-2
Surface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Mass (grams)	Container	Preservation Requirements	Laboratory	Number of Locations	Mass To Specific Labs	Preservative
Surface Sediment Geotechnical List							
Atterberg Limits (ASTM D 4318)	200	16 oz wide-mouth glass or HDPE	Ambient	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	32	260g	0-6°C
Specific Gravity (ASTM D854)	100	16 oz wide-mouth glass	Ambient		32		
Moisture Content (ASTM D 2216)	10	4 oz wide-mouth glass	Ambient		32		
Shear Stress (ASTM D 2850)	Cylindrical sample with height: diameter ratio of 2.0 to 2.5	Undisturbed Shelby Tube	humid atmosphere	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	32	Shelby Tube	Humid Environment
Total Minimal Volume (g)						**260 g plus Shelby Tube**	
Surface Sediment Benthic-Low DO							
Percent Solids	10	4 oz wide-mouth glass	0-6°C	All Laboratories performing sediment analysis	34	10g	0-6°C
TOC (9060 Modified/Lloyd Kahn)	20	8 oz wide-mouth glass	0-6°C; store in dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	34	40 g	0-6°C; store in dark
Ammonia-N (SM4500)	20				34		

Table 7-2
Surface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Mass (grams)	Container	Preservation Requirements	Laboratory	Number of Locations	Mass To Specific Labs	Preservative
Sulfide (9030B)	20	2 oz wide-mouth glass	Fill jar completely with sediment; fill the surface with 10N NaOH/ 2N zinc acetate until moistened.; no headspace; ship on	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	34	20g	Fill jar completely with sediment; fill the surface with 10N NaOH/ 2N zinc acetate until moistened.; no headspace; ship on ice 0-6°C
TAL Metals (Fe and Mn; 6010B/6020)	40	8 oz wide-mouth glass	0-6°C	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	34	40 g	0-6°C
Grain Size (ASTM D442)	100	16 oz wide-mouth glass	Ambient	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719 Mark Dobday 978.635.0012	34	100 g	0-6°C
Total Minimal Volume (g)						**210 g**	
Surface Chemical - Supplemental							
Triterpanes and Steranes (8270C/D-SIM Modified)	50	4 oz wide-mouth glass	0-6°C; store in the dark/ <-10° C store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	TBD	50g	0-6°C; store in the dark/ <-10° C store in the dark
PIANO VOCs (8260 Modified)	40	2 oz jar; no headspace	0-6 degrees Celsius (°C); store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	TBD	40g	0-6 degrees Celsius (°C); store in the dark
Total Minimal Volume (g)						**90g**	

Table 7-3
Surface Sediment Sampling Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Cell phone
- COC forms
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30

Table 7-3
Surface Sediment Sampling Materials and Equipment

specifications/Factory Manual [FM] approved)

- Clipboard
- Custody tape or seals
- Custody transfer forms
- Decontamination supplies (refer to NC-02 - Equipment Decontamination)
- Deionized (DI) "analyte-free" water
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Drum cart
- Drum wrench to tighten open-top drum lids
- Eckman sampler, modified Eckman sampler, modified Van Veen sampler, Petit Ponar sampler, or similar sampling device
- Ethyl acetate for decontamination of NAPL impacted sampling instruments
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
-
- High-pressure/steam cleaner (if required)
- Ice
- IDW log form
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated containers/coolers
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Navigation charts (electronic);
- Overnight courier airbills or shipping forms
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- PID/toxic gas sensor (refer to the HASP [Anchor QEA 2011a])

Table 7-3
Surface Sediment Sampling Materials and Equipment

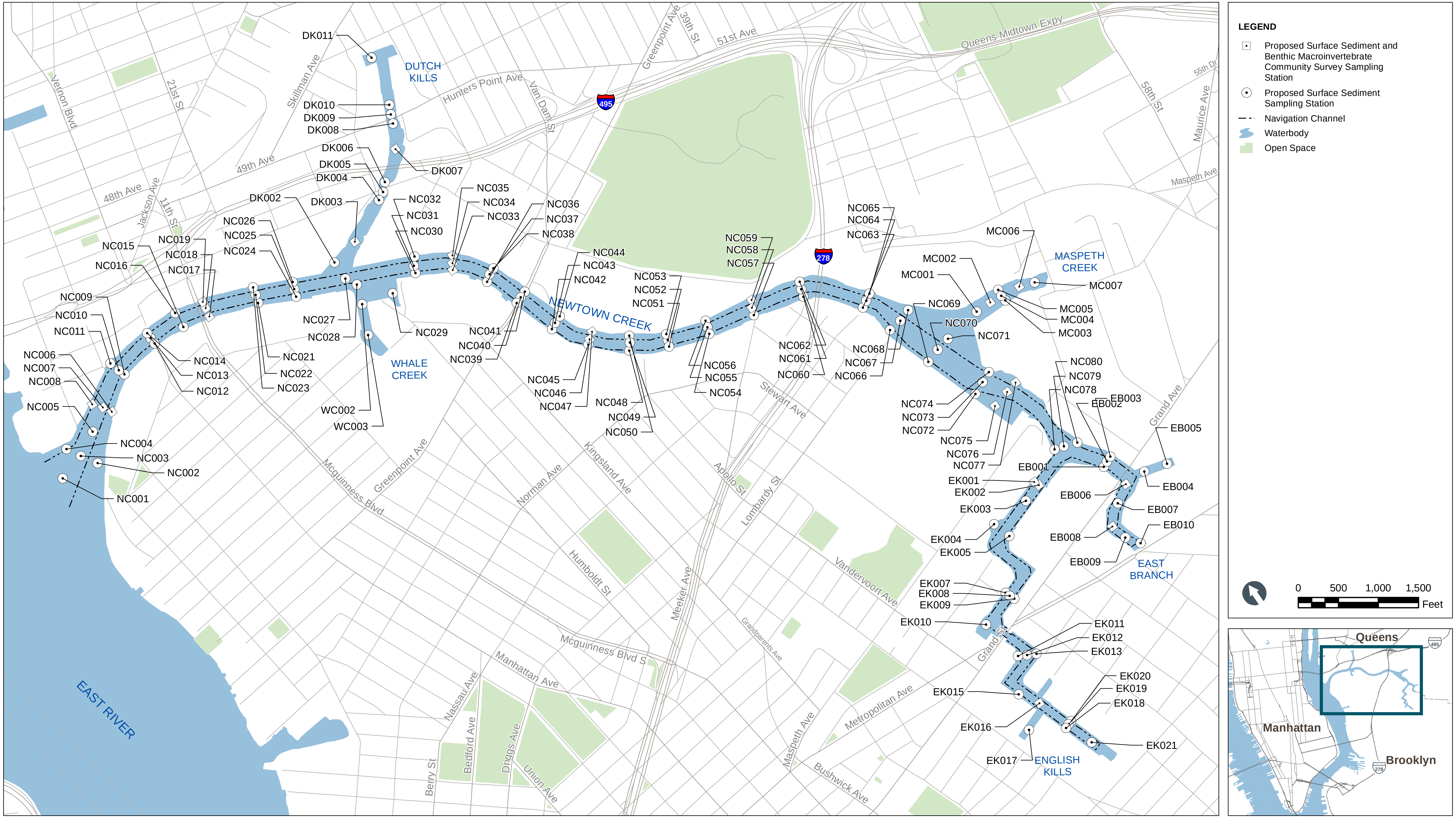
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for equipment rinsate samples
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Ruler and tape measures
- Sample labels
- Sealing tape
- Sediment Grab Collection Record
- Shipping tape
- Siphon tubing and bucket
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Stainless steel bowls and spoons/spatulas (or equivalent)
- Stainless steel bowls or pans (labeled as needed)
- Stand (cradle) on which to place the grab sampler while not in deployment
- Storage racks
- Study Area maps
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Water pump and hoses (optional)
- Zipper-lock bags

See the following SOPs for further details:

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-05 Sediment Grab Sampling

Table 7-3
Surface Sediment Sampling Materials and Equipment

- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal

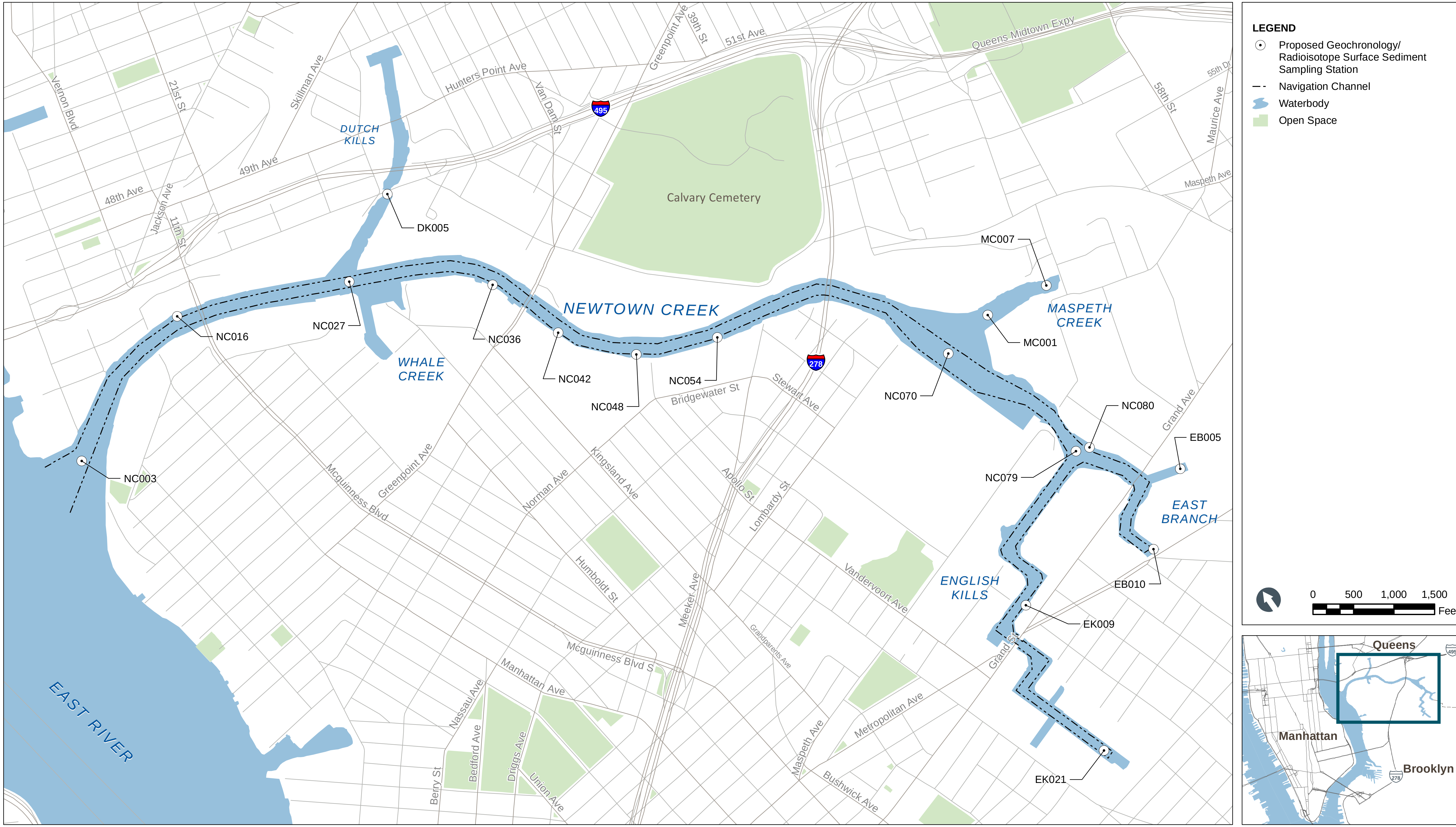


Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 7-1 Proposed Surface Sediment Sampling Stations.mxd lhudson 10/14/2011 3:23:26 PM

ANCHOR QEA

Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

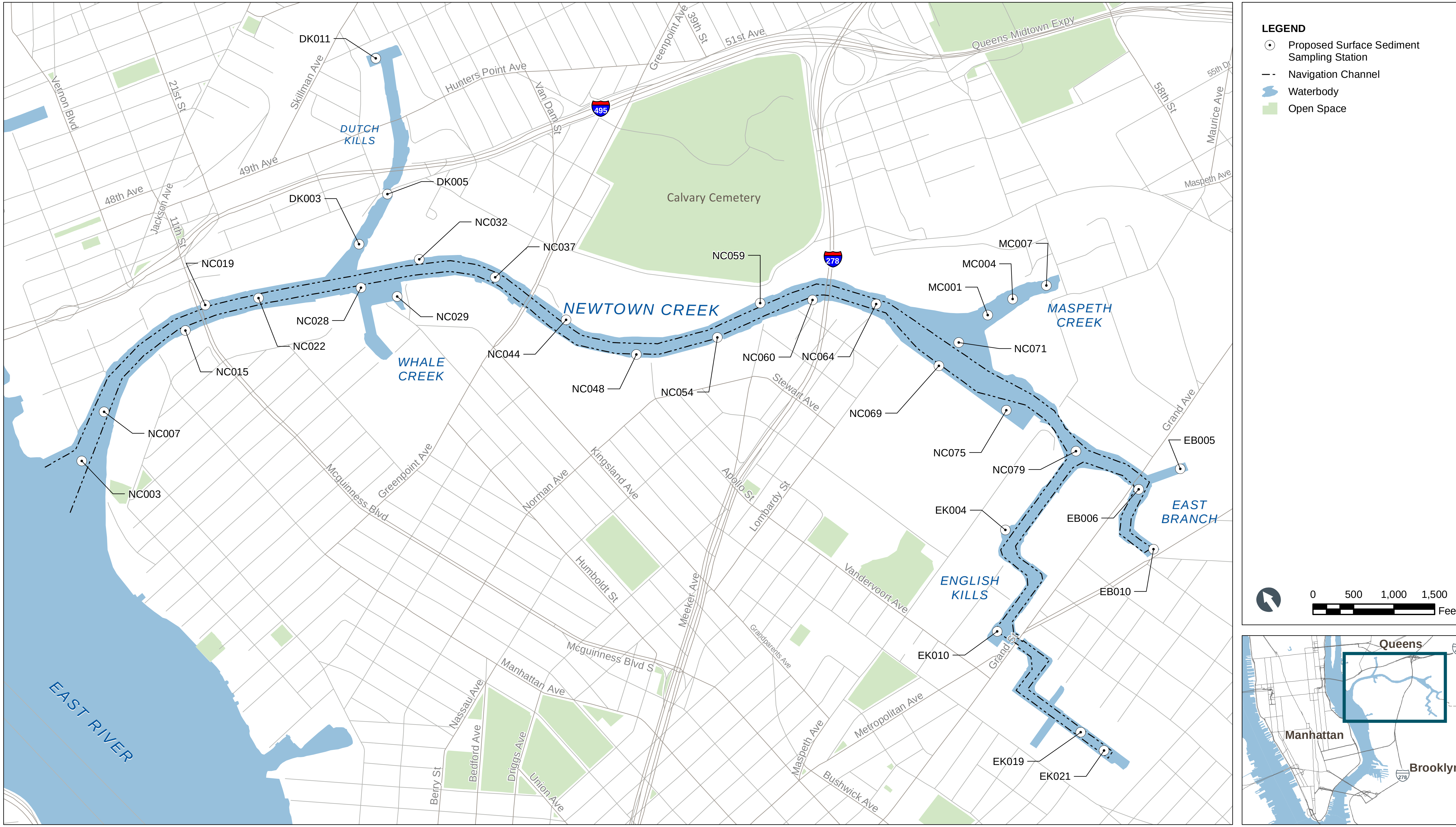
Figure 7-1
Proposed Surface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS



ANCHOR QEA

Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

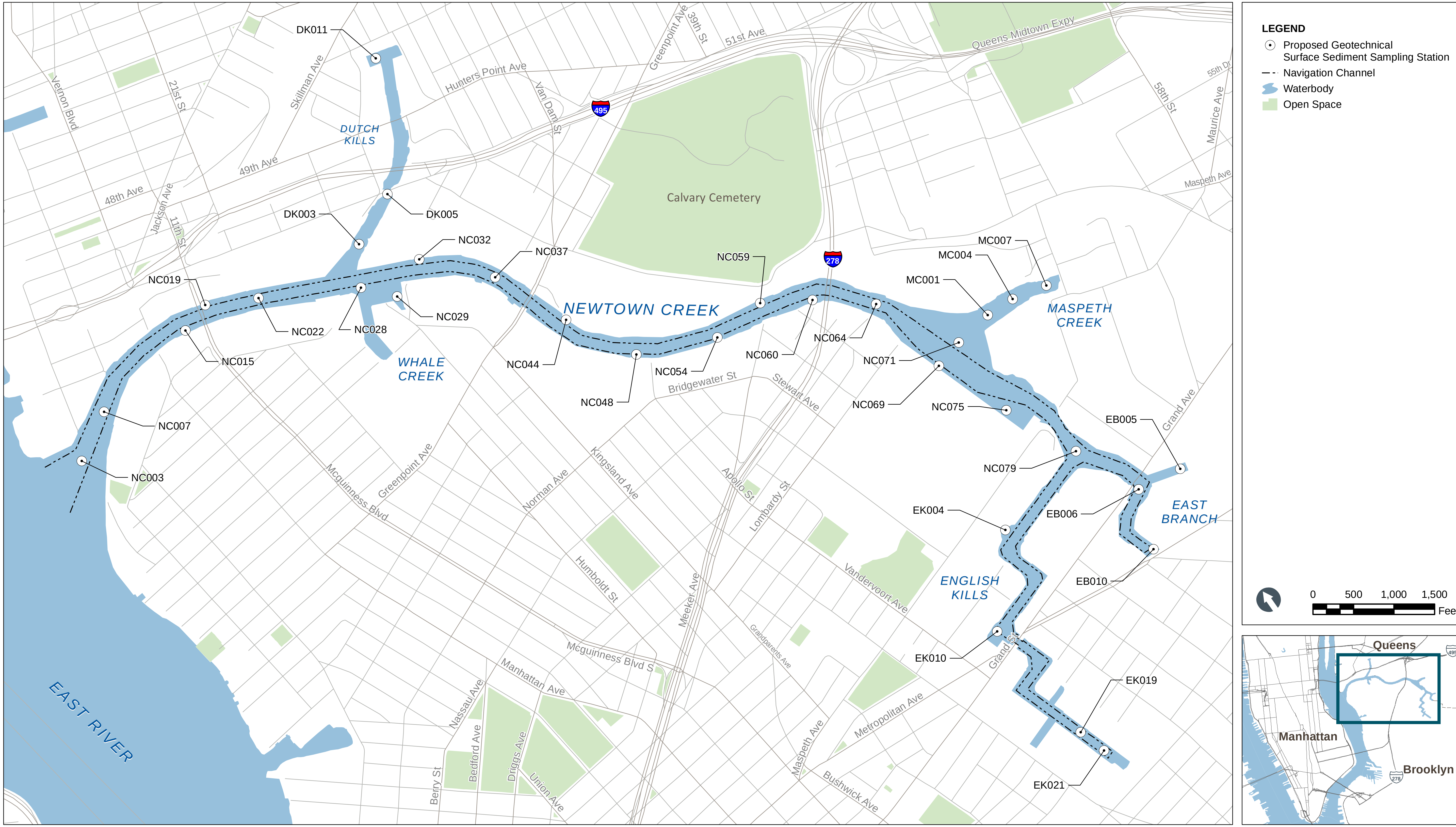
Figure 7-2
Proposed Geochronology/Radioisotope Surface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS



ANCHOR QEA

Note:
Proposed sampling stations are approximate and may bemodified based on field conditions, utilities, access issues, etc.

Figure 7-3
Proposed Surface Sediment Sample Stations for Dioxin-Furan, Pesticides (by HRMS), PCB Congener, and Methyl Mercury
Field Sampling and Analysis Plan
Newtown Creek RI/FS



Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 7-4
Proposed Geotechnical Surface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

8 SUBSURFACE SEDIMENT SAMPLING

This section describes the procedures that will be followed to perform the subsurface sediment sampling activities. Section 7 describes the procedures that will be followed to perform the surface sediment sampling activities. Sedflume procedures are provided in Section 9. Each of these sediment sampling activities will be conducted using different equipment and during separate mobilizations.

8.1 Overview

Purpose. Subsurface sediment sampling will be conducted along the length of the Study Area and its tributaries to meet the following objectives:

1. Characterize the physical properties, chemical nature, thickness, and volume of sediments along the length of the Study Area
2. Establish a list of COPCs in Study Area sediments based on their potential contribution to risk to the environment
3. Characterize the vertical distribution and depositional time history of constituents within the sediment profile, as well as the potential for future natural recovery, using bulk sediment chemistry, geochronology/radioisotope analyses (Lead-210 [^{210}Pb] and Cesium-137 [^{137}Cs][3]), grain size, TOC, and percent moisture distribution of sediment core samples
4. Collect geotechnical and other physical data to support the evaluation of potential remedial alternatives
5. Characterize sediment volumes that will be considered in alternatives during the Feasibility Study.

The Study Area has been dredged along its entire length at some time during its history. In consideration of this history for the purpose of this RI/FS, sediments are defined as the deposits that occur above the native materials.

Existing Data Review. For existing data review of sediment data, see Section 7.

[3] ^{7}Be radioisotope analysis will be performed on surface sediment samples only. ^{210}Pb and ^{137}Cs radioisotope analysis will be performed on subsurface sediment samples only.

Data Gap Assessment Relative to CSM. A comprehensive analysis of sediment chemistry, geotechnical properties, stability, and transport has not been conducted of the entire Study Area. Each of these components is necessary to complete the CSM.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed by obtaining and evaluating existing data as part of the historical data review and by conducting additional sediment sampling and related analyses.

- Surface sediment physical and chemical sampling (Section 7)
- Subsurface sediment physical and chemical sampling (Section 8)
- Sediment Stability and Transport
  - Sediment Geochronology Measurements (Sections 7 and 8)
  - Sedflume testing (Section 9)

Subsurface sediment stations will be sampled for a designated list of parameters. Table 8-1 provides the sampling stations, rationale for each station, and planned analyses for each location. Table 8-2 provides the analyses, volume and container requirements, and laboratory information. Figure 8-1 shows the proposed sampling stations; Figure 8-2 shows the geochronology/radioisotope (geochronology) stations; Figure 8-3 shows the stations for the select chemical analyses (VOCs, dioxins-furans, pesticides, PCB congeners, and methyl mercury); and Figure 8-4 shows the stations for geotechnical analysis. These stations may be adjusted based on the results of the identification of potential utility or other hazards within the Study Area; bathymetric, side-scan sonar, and magnetic surveys; shoreline assessment; and/or field conditions. If a station needs to be moved more than 200 feet parallel to the shoreline and/or 50 feet perpendicular to the shoreline, USEPA will be notified prior to sampling. A log of the rationale for significantly moving any station will be maintained and included in monthly status reports to USEPA.

8.2 Procedures

Sediment sampling and processing activities for subsurface samples are described in the following sections. All of the tasks described in this section will be documented, and this documentation will be stored in the project files as described in the DMP (Anchor QEA

2011c). During on-water sampling activities, shoreline and waterbody conditions will be documented along with any recreational, industrial, and ecological of the Study Area. Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for sample form), and on data collection forms (see SOP NC-06 – Subsurface Coring for sample form) during the sampling period. Photographs will be taken of the subsurface sediment and any significant observations made during sampling.

Subsurface sediment cores will be advanced to 2 feet into the native (pre-navigation channel) soils or to a maximum depth of approximately 20 feet below the mudline, whichever is encountered first and as achievable by the drilling technique. Native sediments will be identified in the field by evaluation of relative rates of core advancement because native sediments are generally highly compacted materials and/or clays which substantially slow core advancement. Upon core retrieval, native sediments will be identified at the bottom of each core by review of the material collected in the core catcher. Sediment cores will be advanced through the overlying sediments using vibracore techniques, where feasible, using the following procedures and in accordance with the referenced SOPs.

Subsurface sediment samples will be collected for chemical and physical characterization from each core according to the following segmentation scheme (as measured below the mudline):

- 15 to 60 cm (0.5 to 2 feet)
- 60 to 100 cm (2 to 3.25 feet)
- 100 to 200 cm (3.25 to 6.50 feet)
- 200 to 300 cm (6.50 to 9.75 feet)
- 300 to 400 cm (9.75 to 13 feet)
- 400 cm (13 feet) to the top of the native soil unit (if encountered)
- 500 cm (17 feet) to the top of native soil unit (if the depth to native soil unit exceeds 500 cm , the previous sample will be from 400 to 500 cm and this sample will be from 500 cm to the native soil unit)
- Native soil unit (silt/clay)

Where the native soil unit is encountered at a shallower depth, fewer samples will be collected (e.g., if the native materials are encountered at 240 cm below mudline, a sediment sample would be collected from the 198 to 240 cm interval, followed by a sample of the native materials). However, the core will be advanced to the maximum depth achievable by the drilling method and if there are indications of contamination, including visual, olfactory, or PID measurements, additional samples of the native materials will also be submitted for analysis. Sample intervals 100 cm or greater in thickness may be adjusted where a stratigraphic change in the sediment sequence (e.g., change in lithology and/or depositional boundary contacts) is observed within a sample interval. For the areas where there is no non-native soft sediment (e.g., dredge or scour areas), cores will be advanced to a minimum of 10 feet, if achievable by the vibracore drilling method. It is noted that if compact clay, bedrock, boulders, debris, or other obstructions are encountered at depths of less than 10 feet, the vibracore drilling method will not be capable of advancing to this depth. Up to three attempts will be made at each location (see SOP NC-06 – Subsurface Coring). If the three attempts do not yield an acceptable core, then two alternate stations—one up to 50 feet directly upstream (toward the headwaters) and one up to 50 feet directly downstream (toward the mouth) of the original station—will be attempted. One attempt at sample collection will be made at the first alternate station. If this attempt does not yield an acceptable sample, then one attempt will be made at the second alternate station. No further attempts will be made if an acceptable sample has not been recovered from either alternate station.

A sufficient number of cores will be collected to provide sediment to fill the required analytical bottles for the sample station, including USEPA split samples if requested by USEPA. Table 8-2 includes a summary of the sample containers required for each analyte.

Subsurface sediment samples will be collected from the mouth of Newtown Creek to the headwaters, which, based on available data, will generally be from the areas of the least sediment contamination to areas of more sediment contamination. When possible, each location in a transect will be sampled prior to moving to the next transect. If access to a location or locations is not possible due to anchored vessels or other issues, samples from these locations will be collected when possible.

During subsurface sediment sampling and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

In addition, during the subsurface sediment sampling and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna

8.2.1 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating subsurface sediment sampling. These include:

- Ensuring that required permits and notifications for the type of sampling and stations within the Study Area have been submitted and approved for the day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the hydrographic surveys.
- Obtaining utility locations for the sampling period and area within the Study Area, ensuring that all utility crossings have been identified (see Section 3), and relocating any station that is within 30 feet vertically or 50 feet horizontally from any utilities or related infrastructure.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone

numbers for each of the moveable bridges. A large boat will be used to complete coring operations, but a small-sized boat may be necessary for some areas of the Study Area, including Dutch Kills where access may be limited by fixed bridge clearance and tributary headwaters where floatables containment booms and areas of sediment accumulation will limit access to a small size boat.

  - Restrictions on the size of vessel may limit the ability to collect 20-foot cores in these areas (i.e., piston core techniques may be employed). If piston cores are employed, this will limit penetration to 8 to 10 feet or less depending upon the conditions encountered.

- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions.
- Calibration of the multi-gas meter based on manufacturer's instructions for use in the processing area.
- Preparation of a daily float plan listing a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, target station coordinates, access points along the Study Area, sample transfer/transport locations, and estimated coring depths. Target coordinates should be pre-loaded into a DGPS unit.
- Obtaining final sample table from the Project Chemist that will be compiled for each sampling mobilization and organized by station. This table will include station number, analyses to be conducted, QA/QC samples required, holding times, preservation, and laboratory address. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.
- Checking that both water level pressure transducers are working properly.

8.2.2 Sampling Activities

It is anticipated that the boat crew for core collection activities will consist of about four field team staff, including a boat captain and three members of the sampling team. The boat crew will be in constant communication with the Field Team Leader during sampling activities. The boat and crew will meet health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the surface sediment sampling, the designated field team staff will check in with the Field Team Leader to confirm the schedule and locations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for sediment core collection:

- Load all pre-cleaned sampling equipment on the boat, include decontamination fluids/equipment, IDW containers, and core storage racks that will hold cores vertical and cold during temporary storage on board the boat and place fresh ice in the core racks.
- Navigate the boat to the target location. The boat will be positioned and secured at the target station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each sample attempt on the Sediment Core Collection Record included in SOP NC-06 – Subsurface Coring. Data will be collected with an external Trimble GeoXH GPS receiver, or similar, capable of sub-foot accuracy.
- Sediment cores will be collected at each location using vibracore techniques. Core samples will be collected by vibracorer; however, if possible, the corer will be lowered slowly to the sediment surface and allowed to penetrate into the sediment and then vibrated as little as possible. Vibracore sampling procedures are detailed in NC-06 – Subsurface Coring. If at all possible, samples for geotechnical analysis will be collected from portions of the core which were advanced without vibrating.
- Once the core is retrieved, the field team staff will evaluate whether the core is acceptable to be retained for processing (i.e., sediment penetration depth, recovery percentage are adequate) per SOP NC-06 – Subsurface Coring. If acceptable, the core will be retained for sample collection. At some locations more than one attempt may

be required to obtain an acceptable core.

- At each station sufficient core volume will be obtained for the parameters that will be analyzed at that station, including QA/QC samples, see Table 8-2 and USEPA-required samples.
  - At each station, one core will be required to achieve the sample volume required for chemistry, select list chemistry, QA/QC, USEPA split and archive samples that will be selectively sampled at every station as described in Table 8-1.
  - At each geochronology/radioisotope sampling station, an additional core will be collected for this analysis.
  - At each geotechnical sampling station, an additional core will be collected for this analysis. Core samples for geotechnical analysis will be collected by vibracorer; however, if possible, the corer will be lowered slowly to the sediment surface and allowed to penetrate into the sediment and then vibrated as little as possible. If at all possible, samples for geotechnical analysis will be collected from portions of the core which were advanced without vibrating.
- The cores will be kept as upright as possible and, as described in SOP NC-06 – Subsurface Coring. The core will then be capped.
- The cores will be segmented into sections of 6 feet or less as required for transport and placed on ice pending transfer to the sample processing area. Each core segment will be labeled with: 1) the station ID; 2) date and time; 3) top and bottom; and 4) sequence (i.e., A, B, C, etc.). Core segments will be kept in as vertical a position as possible at all times pending processing.
- All material from unacceptable cores, decontamination fluids, and spent PPE will be containerized as IDW and disposed of according to SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.
- All field activities will be documented, including core collection activities and custody transfer of the cores, and the Core Collection Log will be filled out in its entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files. At

the end of the day and between each station, all sampling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination.

8.2.3 Sample Processing

Sediment cores will be held at the field facility and processed as presented below. Sampling nomenclature is presented in Section 14.2.1 and sample analysis is presented in Section 8.4.1.

- Sediment cores will be transferred to the field processing facility under COC procedures per Section 14.2.2 and in accordance with SOP NC-13 – Sample Custody. The segmented cores (6 feet or less) will be stored in an upright position in a cooler at 4°C until ready for processing.
- Excess water in the cores will be removed prior to further processing (see SOP NC-08 – Sediment Core Processing).
- Split the core into longitudinal halves by inserting a decontaminated flat blade tool (spatula or putty knife, etc.) into each sediment interval through the cuts in the core liner. Use one tool for each sample interval, being careful not to cross-contaminate adjacent intervals. Open the tube lengthwise, carefully separating the core half-sections, and align them on the plastic sheeting.
- Screen the length of the core with a multi-gas meter with PID and record the results on the Lithology Record.
- To minimize the loss of volatiles, the sample for VOC analysis will be collected immediately after splitting the core in half as described above. Prior to core characterization, representative portions along the entire length of each sampling interval in the core will be sampled and transferred directly into a 2-oz glass sample jar and filled completely allowing no headspace as described in SOP NC-08 – Sediment Core Processing.
- Discrete samples for analyses other than VOCs that cannot be composited (methyl mercury and radioisotopes [^{210}Pb and ^{137}Cs]) will be collected from designated cores as described in SOP NC-08 – Sediment Core Processing and NC-09 – Geochronology Core Processing. These samples will not be collected from composited samples.
- Once discrete samples are collected, the remainder of the sample interval will be retained for additional processing, as required, and for photographing and material description.

- Sediments in each core segment will be logged using the USCS and information recorded on a lithology record (sample provided in SOP NC-08 – Sediment Core Processing) to include primary grain size, minor constituents, color, consistency, odors, and visible evidence of impacts (e.g., sheen).
- A photographic log will be kept of each core segment. For each core segment a representative photograph will be taken with a place card of the sample station, and sample interval, and a ruler visible in the photograph.
- Core samples for general chemistry and physical parameters will be processed using procedures detailed in SOP NC-08 – Sediment Core Processing. Archive samples will be collected from each homogenized interval for subsequent analysis. Geochronology/radioisotope samples will be collected from a separate core at the field facility; 2-cm intervals will be collected and archived down the length of the core, with seven intervals analyzed above the native contact. These geochronology samples will be collected as discrete samples and will not be composited.
- An archive core from each station placed in the archive freezer for potential future chemical and supplemental analyses.
- Samples will then be placed in the appropriate laboratory-provided sample containers (refer to sample table provided by the Project Chemist).
- Once samples are prepared, the samples will be checked and information will be entered onto a COC Record for transport to the laboratory per SOP NC-13 – Sample Custody. Sample containers will be placed in a placed in a secure refrigerated (4°C) area pending shipment to the analytical laboratory per SOP NC-14 – Sampling Packing and Shipping. Sample handling and shipping procedures are discussed in Section 14.2.
- All field activities will be documented including sample processing procedures, sample collection and COC, and shipment to the laboratories. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files.
- At the end of the day and between sample intervals, all processing equipment will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next use.

8.2.4 Sample Location and Frequency

Sample stations are shown in Figures 8-1 to 8-4. The Phase 1 RI Field Program includes one round of subsurface sediment sampling.

8.2.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. Nomenclature is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 8-1 to 8-4. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SC = Chemistry sediment core
  - GC = Geochron sediment core
  - RB = Rinsate blank
  - TB = Trip blank
- Depth: Sediment samples = 6-character identifier indicating the depth in centimeters from where the samples were collected.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A chemistry core sample collected at the 26th station of the Newtown Creek area with a depth of 198 to 297 cm collected on September 8, 2011 would have the id: NC026SC-198-297-20110908
- The duplicate of this sample would have the id: NC1026SC-198-297-20110908
- A rinsate blank collected in association with chemistry core sampling collected on June 1, 2012 would have the id: SC-RB-20120601

8.2.6 Sample Handling and Analysis

Subsurface sediment samples will be analyzed for a broad list of constituents identified in the RI/FS Work Plan Table 4-4 (AECOM 2011) and summarized by analysis in Table 8-1 of this FSAP and in QAPP (Anchor QEA 2011b) Worksheet #20 (Field Quality Control Sample Summary Table). Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Table 8-2 provides the list of analyses, containers, sample size, and laboratory information. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

8.2.7 Equipment Decontamination

Subsurface sediment sampling equipment will be in contact with Study Area media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

8.2.8 Investigation-Derived Waste

IDW will be generated during the performance of the subsurface sediment sampling coring and during equipment decontamination. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

8.2.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-06 – Subsurface Coring
- NC-08 – Sediment Core Processing
- NC-09 – Geochronology Core Processing
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation

8.2.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 8-3.

8.3 Data Processing, Analysis, and Management

Electronic data collection records from subsurface sediment sampling activities, including sample collection, processing, and sample management, will be downloaded as possible and saved to the electronic project files. Paper records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

Analytical data will be validated as described in the QAPP (Anchor QEA 2011b). Analytical data will be maintained the project database and accessible only by designated project personnel as described in the DMP (Anchor QEA 2011c).

8.4 Reporting

Information obtained during subsurface sediment sampling and processing activities for sediment chemistry and physical characterization, and geochronology measurements will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

8.5 Schedule

Phase 1 RI Field Program subsurface sediment sampling activities are planned to be conducted in one field mobilization. It is anticipated that this subsurface sediment sampling will be conducted over a 4-month time period. The schedule will be dependent on weather and field conditions.

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
DK002	999110.0532	208137.1781	Dutch Kills at Confluence with Newtown Creek	Sediment Core - Spatially along Study Area - Near confluence with Newtown Creek	Subsurface Chemical-All List
DK004	1000012.844	208454.282	Dutch Kills, Lower Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading	Subsurface Chemical-All List
DK005	1000111.291	208508.0233	Dutch Kills, Lower Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading Geochronology Core - Spatially along Study Area - In area of potential sediment loading Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All, Subsurface Chemical-Select List, and Geochronology List
DK006	1000201.944	208594.8129	Dutch Kills, Lower Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, in area of potential sediment loading	Subsurface Chemical-All List
DK008	1000701.698	209137.1112	Dutch Kills, Upper Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, in area where sediment loading is occurring	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
DK009	1000747.285	209246.1498	Dutch Kills, Upper Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, near area where sediment loading is occurring	Subsurface Chemical-All List
DK010	1000800.173	209354.2984	Dutch Kills, Upper Reach	Sediment Core - Spatially along Study Area - Along transect parallel to banks in narrow portion of tributary, near area where sediment loading is occurring	Subsurface Chemical-All List
DK011	1001089.061	209964.0173	Head of Dutch Kills	Sediment Core - Spatially along Study Area - Near head of tributary where sediment loading is occurring Geotechnical Core - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Geotechnical List, and Subsurface Chemical-Select List
EB001	1005511.352	200541.6285	Near Shoreline of East Branch, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
EB002	1005582.6	200571.3785	Channel of East Branch, Lower Reach	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
EB003	1005652.413	200598.6722	Near Shoreline of East Branch, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
EB004	1005890.647	200201.5561	East Branch, Side Channel	Sediment Core - Spatially along Study Area - Near head of tributary where sediment loading is occurring	Subsurface Chemical-All List
EB005	1006181.067	200119.2434	East Branch, Head of Side Channel	Sediment Core - Spatially along Study Area - At head of tributary where sediment loading is occurring Geochronology Core - Spatially along Study Area - At headwaters of tributary where sediment loading is occurring	Subsurface Chemical-All List and Geochronology List
EB007	1005394.226	200068.4344	Channel of East Branch, Middle Reach	Sediment Core - Spatially along Study Area	Subsurface Chemical-All List
EB009	1005223.691	199662.0581	Channel of East Branch, Upper Reach, Near Head of East Branch	Sediment Core - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
EB010	1005320.943	199517.815	Head of East Branch	Sediment Core - Spatially along Study Area - At head of tributary where sediment loading is occurring Geochronology Core - Spatially along Study Area - At head of tributary where sediment loading is occurring Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geochronology List
EK003	1004471.493	200749.5603	Channel of English Kills, Lower Reach	Sediment Core - Spatially along Study Area	Subsurface Chemical-All List
EK004	1003920.202	200774.9148	Near Shoreline of English Kills, Lower Reach	Sediment Core - Spatially along Study Area - Near upland property - Near area where a sheen has been observed Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
EK005	1004047.493	200383.9638	Near Shoreline of English Kills, Lower Reach	Sediment Core - Spatially along Study Area - Near upland property - Across dredged channel near area where a sheen has been observed	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
EK007	1003606.979	199953.3351	Near Shoreline of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks associated with core inside of dredged channel	Subsurface Chemical-All List
EK008	1003625.762	199895.9735	Channel of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks associated with cores outside of dredged channel	Subsurface Chemical-All List
EK009	1003655.319	199831.921	Near Shoreline of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List
EK010	1003180.411	199770.0307	Near Shoreline of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - In potential depositional area Geotechnical Sample - Spatially along Study Area - In potential deposition area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
EK011	1003281.971	199219.2877	Near Shoreline of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
EK012	1003380.078	199166.4839	Channel of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Inside of dredged channel, along transect perpendicular to banks associated with cores outside of dredged channel	Subsurface Chemical-All List
EK013	1003483.518	199109.9468	Near Shoreline of English Kills, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
EK015	1003012.848	198821.8218	Channel of English Kills, Upper Reach	Sediment Core - Adjacent to upland site	Subsurface Chemical-All List
EK017	1002862.736	198386.7308	Channel of English Kills, Upper Reach	Sediment Core - Adjacent to upland site - Near head of tributary in area where sediment loading is occurring	Subsurface Chemical-All List
EK018	1003256.195	198140.5522	Near Shoreline of English Kills, Upper Reach	Sediment Core - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
EK019	1003308.988	198159.208	Channel of English Kills, Upper Reach	Sediment Core - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - Inside of dredged channel - Along transect perpendicular to banks associated with cores outside of dredged channel Geotechnical Core - Spatially along Study Area Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List
EK020	1003358.048	198172.532	Near Shoreline of English Kills, Upper Reach	Sediment Core - Spatially along Study Area - Near head of tributary in area where sediment loading is occurring - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses [2]
EK021	1003415.709	197812.1642	Channel Near Head of English Kills	Sediment Core - At head of tributary where sediment loading is occurring Geochronology Core - Spatially along Study Area - At head of tributary where higher sediment loading is occurring Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geochronology List
MC001	1005324.506	203037.0367	Channel of Maspeth Creek, Lower Reach	Sediment Core - Spatially along Study Area - Near Respondent property - In tributary in area where sediment loading is occurring Geochronology Core - In area of higher sediment loading Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geochronology List
MC003	1005694.578	202945.8248	Near Shoreline of Maspeth Creek, Middle Reach	Sediment Core - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
MC004	1005689.039	203021.2564	Channel of Maspeth Creek, Middle Reach	Sediment Core - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - Inside of dredged channel - Along transect perpendicular to banks associated with cores outside of dredged channel Select Analyses (dioxin-furan, pesticides [by HRMS], PCB congener, and methyl mercury) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
MC005	1005698.2	203104.2124	Near Shoreline of Maspeth Creek, Middle Reach	Sediment Core - Part of transect adjacent to Respondent site - In tributary in area where sediment loading is occurring - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
MC007	1006124.506	202922.5149	Channel of Maspeth Creek, Upper Reach	Sediment Core -Near head of tributary in area where sediment loading is occurring Geochronology Core - In area of higher sediment loading Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List and Geochronology List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses [2]
NC001	994787.3689	207874.3064	Mouth of Newtown Creek at Confluence with East River	Sediment Core - Within proposed NYC dredging area	Subsurface Chemical-All List
NC002	995253.7507	207780.5987	Near Shoreline of Newtown Creek Near Confluence with East River	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel - Adjacent to proposed NYC dredging area near mouth of Newtown Creek	Subsurface Chemical-All List
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	Sediment Core - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel - Within proposed NYC dredging area near mouth of Newtown Creek Geotechnical Core - Spatially along Study Area Geochronology Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select, Geotechnical List, and Geochronology List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
NC004	995034.1653	208145.9183	Near Shoreline of Newtown Creek Near Confluence with East River	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel - Within proposed NYC dredging area near mouth of Newtown Creek	Subsurface Chemical-All List
NC005	995426.3033	208136.0479	Channel of Newtown Creek, Lower Reach, Near Confluence with East River	Sediment Core - Spatially along Study Area - Within proposed NYC dredging area near mouth of Newtown Creek	Subsurface Chemical-All List
NC009	996162.7376	208495.6925	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC010	996133.0867	208579.5995	Channel of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks associated with cores outside of dredged channel	Subsurface Chemical-All List
NC011	996095.8143	208706.7302	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
NC015	997102.6275	208557.4293	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core on other side of dredged channel Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List
NC016	997118.7584	208760.8279	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core on other side of dredged channel Geochronology Core - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List
NC021	998037.3837	208269.148	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
NC022	998071.2981	208371.6912	Channel of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core on other side of dredged channel Geotechnical Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List
NC023	998099.2788	208465.7602	Near Shoreline of Newtown Creek, Lower Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC024	998474.9248	208061.1554	Near Shoreline of Newton Creek, Lower Reach	Sediment Core - Spatially along Study Area	Subsurface Chemical-All List
NC027	999179.0154	207865.0004	Channel of Newtown Creek at Whale Creek/Dutch Kills	Sediment Core - Spatially along Study Area Geochronology Core - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
NC028	999178.9071	207748.8749	Channel of Newtown Creek at Whale Creek/Dutch Kills	Sediment Core - Adjacent to proposed NYC dredging area in Whale Creek Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
NC029	999486.168	207403.7088	Near Shoreline of Newtown Creek, Near Whale Creek	Sediment Core - Spatially along Study Area - In potential depositional area	Subsurface Chemical-All List
NC030	999861.0965	207446.8157	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC031	999897.5514	207534.9509	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC032	999971.2964	207622.2335	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
NC036	1000531.995	206848.2136	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
NC037	1000611.322	206907.0518	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel Geotechnical Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List
NC038	1000690.005	206937.7448	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC039	1000683.914	206418.0346	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC040	1000765.176	206444.1619	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List
NC041	1000847.437	206472.968	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC042	1000856.813	205896.3456	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Adjacent to Respondent property	Subsurface Chemical-All List and Geochronology List
NC043	1000933.579	205937.9131	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC044	1001025.685	205971.7412	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
NC045	1001119.55	205481.8418	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC048	1001490.362	205124.5104	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Spatially along Study Area - adjacent to Respondent property Geotechnical Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, Geochronology List, and Geotechnical List
NC049	1001554.654	205202.2987	Channel of Newtown Creek, Middle Reach	Sediment Core - Adjacent to Respondent property - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
NC050	1001599.007	205279.2285	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC051	1001929.408	204878.7451	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel	Subsurface Chemical-All List
NC054	1002431.792	204721.5222	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Spatially along Study Area - Near Respondent property Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geochronology List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses[2]
NC055	1002459.849	204802.7543	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List
NC056	1002487.906	204883.9864	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC057	1003021.703	204596.6847	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses [2]
NC060	1003659.146	204427.4841	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geotechnical Core - Spatially along Study Area. Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List
NC061	1003690.084	204520.1618	Channel of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List
NC062	1003730.106	204609.3855	Near Shoreline of Newtown Creek, Middle Reach	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent property - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses [2]
NC063	1004190.52	203890.8764	Near Shoreline of Newtown Creek, Upper Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC064	1004273.859	203937.8113	Channel of Newtown Creek, Upper Reach	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List
NC065	1004354.769	203989.2312	Near Shoreline of Newtown Creek, Upper Reach	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC066	1004307.519	203467.7174	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent site - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
NC067	1004478.264	203491.0118	Channel of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent site - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List
NC068	1004634.763	203543.5857	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - In transect adjacent to Respondent site - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC069	1004468.981	202870.6412	Near Shoreline of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List and Subsurface Chemical-Select List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC070	1004730.236	202892.8872	Channel of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel Geochronology Sample - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List
NC071	1004835.206	202964.6631	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geotechnical Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, and Geotechnical List
NC072	1004721.41	202201.9118	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC073	1004879.456	202273.5048	Channel of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel	Subsurface Chemical-All List
NC074	1005015.935	202331.4216	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List
NC078	1005132.142	201069.3674	Near Shoreline of Newtown Creek, at Confluence with English Kills and East Branch	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale	Analyses [2]
NC079	1005252.387	200965.302	Channel of Newtown Creek, at Confluence with English Kills and East Branch	Sediment Core - Spatially along Study Area - Inside dredged channel - Along transect perpendicular to banks, associated with cores outside of dredged channel Geotechnical Core - Spatially along Study Area Geochronology Core - Spatially along Study Area Select analyses (dioxin-furan, pesticides [by HRMS], PCB congener, methyl mercury, and VOCs) - Spatially along Study Area	Subsurface Chemical-All List, Subsurface Chemical-Select List, Geotechnical List, and Geochronology List Surface Water Chemical-All List
NC080	1005413.803	200977.574	Near Shoreline of Newtown Creek, at Confluence with English Kills and East Branch	Sediment Core - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with core inside of dredged channel Geochronology Core - Spatially along Study Area	Subsurface Chemical-All List and Geochronology List
WC002	999093.921	207511.3399	Channel of Whale Creek, Lower Reach	Sediment Core - Spatially along Study Area - Within proposed NYC dredging area in Whale Creek	Subsurface Chemical-All List

Table 8-1
Subsurface Sediment Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
WC003	998936.3089	207154.2043	Channel of Whale Creek, Upper Reach	Sediment Core - Spatially along Study Area - Within proposed NYC dredging area in Whale Creek	Subsurface Chemical-All List

Notes:
1 - Sampling locations are approximate and may be modified based on field conditions, access issues, etc.
2 - Specific analyses that comprise the analyte groups described are provided in Table 8-2.
NAD = North American Datum

Table 8-2
Subsurface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (g)	Container	Preservation Requirements	Lab	Number of Locations	Mass To Specific Labs	Preservative
Subsurface Sediment Chemical-All List							
Percent Solids	10 grams per each lab (7 labs) = 70 g	4 oz wide-mouth glass	0-6°C	All Laboratories performing sediment analysis	95	10 grams per each lab (7 labs) = 70 g	0-6°C
PAHs and alkyl PAHs (8270-C/D-SIM)	50	8 oz wide-mouth glass	0-6°C; store in the dark/ <-10° C store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	95	100g	0-6°C; store in the dark/ <-10° C store in the dark
n-Alkanes and Isoprenoids Including DRO and TPH Ranges (8015 Modified)	50	From PAH/Alkyl PAH jar	0-6°C; store in the dark/ <-10° C store in the dark		95		

Table 8-2
Subsurface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (g)	Container	Preservation Requirements	Lab	Number of Locations	Mass To Specific Labs	Preservative
TOC (9060 Modified/Lloyd Kahn)	20	8 oz wide-mouth glass	0-6°C; store in the dark/ <-10° C store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	95	95g	0-6°C; store in the dark/ <-10° C store in the dark
Ammonia-N (SM4500)	20	From TOC jar	0-6°C		95		0-6°C; store in dark
Cyanide (9010B)	20	From TOC jar	0-6°C		95		
Total Phosphorus (SM-4500)	5	From TOC jar	0-6°C		95		
pH (9045D)	20	From TOC jar	0-6°C		95		
Total Nitrogen (Alpha TKN + NO3/NO2)	10	From TOC jar	0-6°C		95		
Sulfide (9030B)	20	2 oz wide-mouth glass	Pour 10 N sodium hydroxide (NaOH)/1N Zinc Acetate solution over the top of the sample; no headspace; /0-6°C	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	95	20g	Pour 10 N sodium hydroxide (NaOH)/1N Zinc Acetate solution over the top of the sample; no headspace; /0-6°C
TAL Metals plus Tin (6010B/6020)	40	8 oz wide-mouth glass	0-6°C/ <-10°C		95	40g	0-6°C; store in the dark/ <-10° C store in the dark
Soot Carbon (Gustafsson et al., 1997)	10	4 oz wide-mouth glass	0-6°C; store in dark		95	10g	0-6°C; store in dark

Table 8-2
Subsurface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (g)	Container	Preservation Requirements	Lab	Number of Locations	Mass To Specific Labs	Preservative
Mercury (1631 Modified)	10	8 oz wide-mouth glass	≤ -15°C	Brooks Rand Laboratory 3958 6th Ave NW Seattle, WA 98107	95	10g	≤ -15°C; store in the dark
Grain Size (ASTM D422)	100	16 oz wide-mouth glass or high density polyethylene (HDPE)	Ambient	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	95	150g	Ambient
Bulk Density (ASTM D7263)	50	4-oz jar	Ambient		95		
TCL SVOCs plus 1,4-Dioxane and TICs (8270C/D)	30	8 ounce (oz) wide-mouth glass jar	0-6°C; store in the dark/ <-10° C store in the dark	TestAmerica 301 Alpha Drive Pittsburgh, PA 15238	95	120g	0-6°C; store in the dark/ <-10° C store in the dark
Organochlorine Pests (8081A)	30	From SVOC jar	0-6°C; store in the dark/ <-10° C store in the dark		95		
Chlorinated Herbicides (8151A)	30	From SVOC jar	0-6°C; store in the dark/ <-10° C store in the dark		95		
TCL PCBs Aroclors (8082)	30	From SVOC jar	<-10° C; store in the dark		95		
Total Minimal Volume (g)	**615**						
Subsurface Sediment Chemical-Select List							
TCL VOCs plus TICs (8260B)	40	2 oz jar; no headspace	0-6 degrees Celsius (°C); store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	24	40g	0-6 degrees Celsius (°C); store in the dark
Methyl Mercury (1630 Modified)	10	2 oz wide-mouth glass	≤ -15°C	Brooks Rand Laboratory 3958 6th Ave NW Seattle, WA 98107	24	10g	≤ -15°C

Table 8-2
Subsurface Sediment Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (g)	Container	Preservation Requirements	Lab	Number of Locations	Mass To Specific Labs	Preservative
209 PCB Congeners and Homolog Groups (1668A)	20	4 oz wide-mouth glass	<-10° C; store in the dark	SGS North America 5500 Business Drive, Wilmington, NC 28405	24	40g	<-10° C; store in the dark
Dioxins and Furans (1613B)	20	From PCB congeners jar	<-10° C; store in the dark		24		
Organochlorine Pesticides (HRMS-s/1669)	40	4 oz wide-mouth glass jar	0-6°C; store in the dark/ <-10° C store in the dark	TestAmerica 301 Alpha Drive Pittsburgh, PA 15238	24	40g	0-6°C; store in the dark/ <-10° C store in the dark
Total Minimal Volume (g)	**170**						
Subsurface Sediment-Geochronology List							
Radionuclides (^{137}Cs,^{210}Pb)	200	4 oz wide-mouth glass or plastic	Ambient	Mass Spec Services Division of Geonuclear, Inc. 103 S. Greenbush Rd. Orangeburg, New York 10962	17		None
Total Minimal Volume (g)	**200**					**200 g**	
Subsurface Sediment-Geotechnical List							
Atterberg Limits (ASTM D 4318)	200	16 oz wide-mouth glass	Ambient	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	10	260g	Ambient
Specific Gravity (ASTM D 854)	100	16 oz wide-mouth glass	Ambient		10		
Moisture Content (ASTM D 2216)	10	4 oz wide-mouth glass	Ambient		10		
Shear Stress (ASTM D 2850)	Cylindrical sample with height: diameter ratio of 2.0 to 2.5	Undisturbed Shelby Tube	Humid atmosphere	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	10	Shelby Tube	Humid atmosphere
Total Minimal Volume (g)	**260 g plus Shelby Tube**						
Subsurface Chemical - Supplemental							
Triterpanes and Steranes (8270C/D-SIM Modified)	50	4 oz wide-mouth glass	0-6°C; store in the dark/ <-10° C store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	TBD	50g	0-6°C; store in the dark/ <-10° C store in the dark
PIANO VOCs (8260 Modified)	40	2 oz jar; no headspace	0-6 degrees Celsius (°C); store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	TBD	40g	0-6 degrees Celsius (°C); store in the dark
Total Minimal Volume (g)	**90g**						

Table 8-3

Subsurface Sediment (Core) Sampling Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Air monitoring instruments and manuals (Photoionization detector (PID), multi-gas detector, and calibration supplies)
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 - Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Approximately 6 inches of Teflon® tubing
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Battery charger
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Calibration Gas: Compressed gas cylinder of isobutylene in air or similar stable gas

Table 8-3

Subsurface Sediment (Core) Sampling Materials and Equipment

mixture of known concentration. The selected gas should have an ionization potential similar to that of the vapors to be monitored, if known.

- Cell phone
- COC forms (electronic)
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30 specifications/Factory Manual [FM] approved)
- Clear plastic sealing tape
- Clipboard
- Commercially-supplied zero grade air (optional)
- Core cutting table and cutting tools
- Cutting tools (electric sheet metal shears, circular saw, or similar tool, with spare blades)
- Core log and processing forms
- Core storage rack to hold cores vertical and keep cold prior to either processing or placement in a refrigerator
- Custody tape or seals
- Decontaminated core tube caps
- Decontaminated polybutyrate (plastic Lexan) core tube liners
- Decontaminated stainless steel bowls and utensils (spoons, spatulas)
- Decontamination supplies (refer to SOP NC-02 - Equipment Decontamination)
- Deionized (DI) "analyte-free" water
- Deployment equipment (e.g., A-frames, winches, generator)
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Drill and drill bits
- Drum cart
- Drum wrench to tighten open-top drum lids
- Echo sounder with a resolution of 0.1 foot
- Electrical and/or duct tape
- Equipment user manuals

Table 8-3

Subsurface Sediment (Core) Sampling Materials and Equipment

- Field balance (0.1 g)/calibration weights
- Field calibration sheets
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hacksaw with spare decontaminated blades and case knives
- Hand-held electronic recording device (optional)
- Ethyl acetate
- High-pressure/steam cleaner (if required)
- Ice
- IDW log form
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated coolers
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Methanol (pesticide grade or better)
- Moisture traps
- Navigation charts and core locations figure
- Overnight courier airbills or shipping forms
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-labeled and pre-preserved sample bottles for equipment rinseate samples
- Positioning equipment (refer to SOP NC-04 - Navigation/Boat Positioning)
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Refrigerator and freezer
- Regulator for calibration gas cylinder
- Real Time Kinematic (RTK) DGPS positioning system (optional)

Table 8-3

Subsurface Sediment (Core) Sampling Materials and Equipment

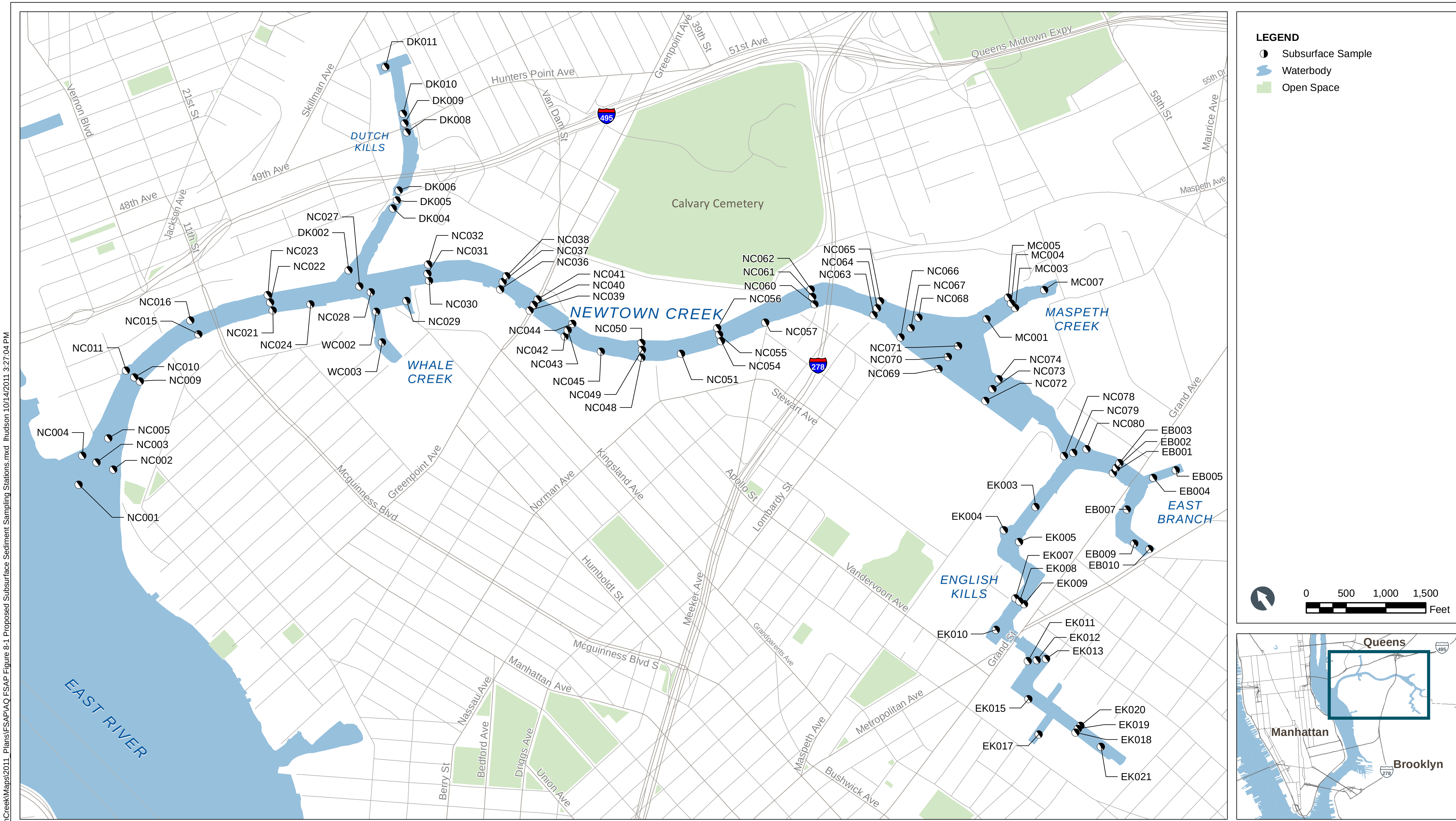
- Ruler and tape measures
- Sample labels
- Sample processing tables
- Sealing tape
- Shipping tape
- Small (cooler-size) storage containers
- Spare lamps
- Squeeze and/or spray bottles
- Stainless steel bowls or pans (labeled as needed)
- Stainless steel dividing tools (wide blade spatulas, putty knifes, or similar tools)
- Storage racks
- Study Area maps
- Submersible pump and hose
- Tap water source (any treated municipal water supply)
- Tedlar bag (optional)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Tube cutter (for cutting core liners vertically)
- Unified Soil Classification System (USCS) Charts
- Vertical core stand and containment basin
- Vibracoring device
- Volatile organic compound (VOC) sub-sampling devices (cut-off syringe, Terra Core Sampler™, Easy-Draw Syringe™)
- Zipper-lock bags

Table 8-3

Subsurface Sediment (Core) Sampling Materials and Equipment

See the following SOPs for further details:

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-06 Sediment Coring Using a Vibracorer
- NC-08 Sediment Core Processing
- NC-09 Geochronology Sample Processing
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 Photoionization Detector (PID) Calibration and Operation

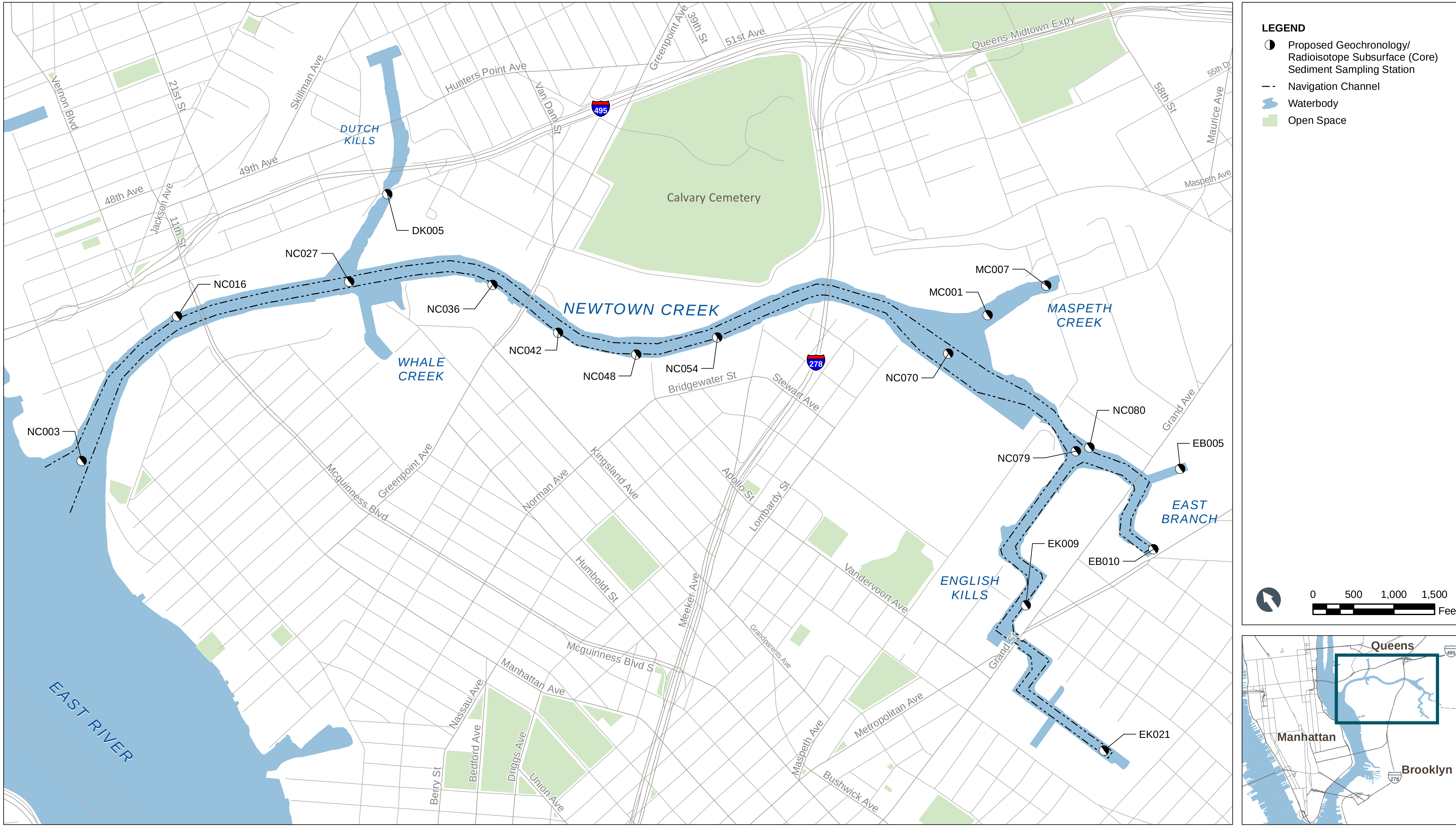


Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 8-1 Proposed Subsurface Sediment Sampling Stations.mxd lhudson 10/14/2011 3:27:04 PM

ANCHOR QEA

Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 8-1
Proposed Subsurface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS



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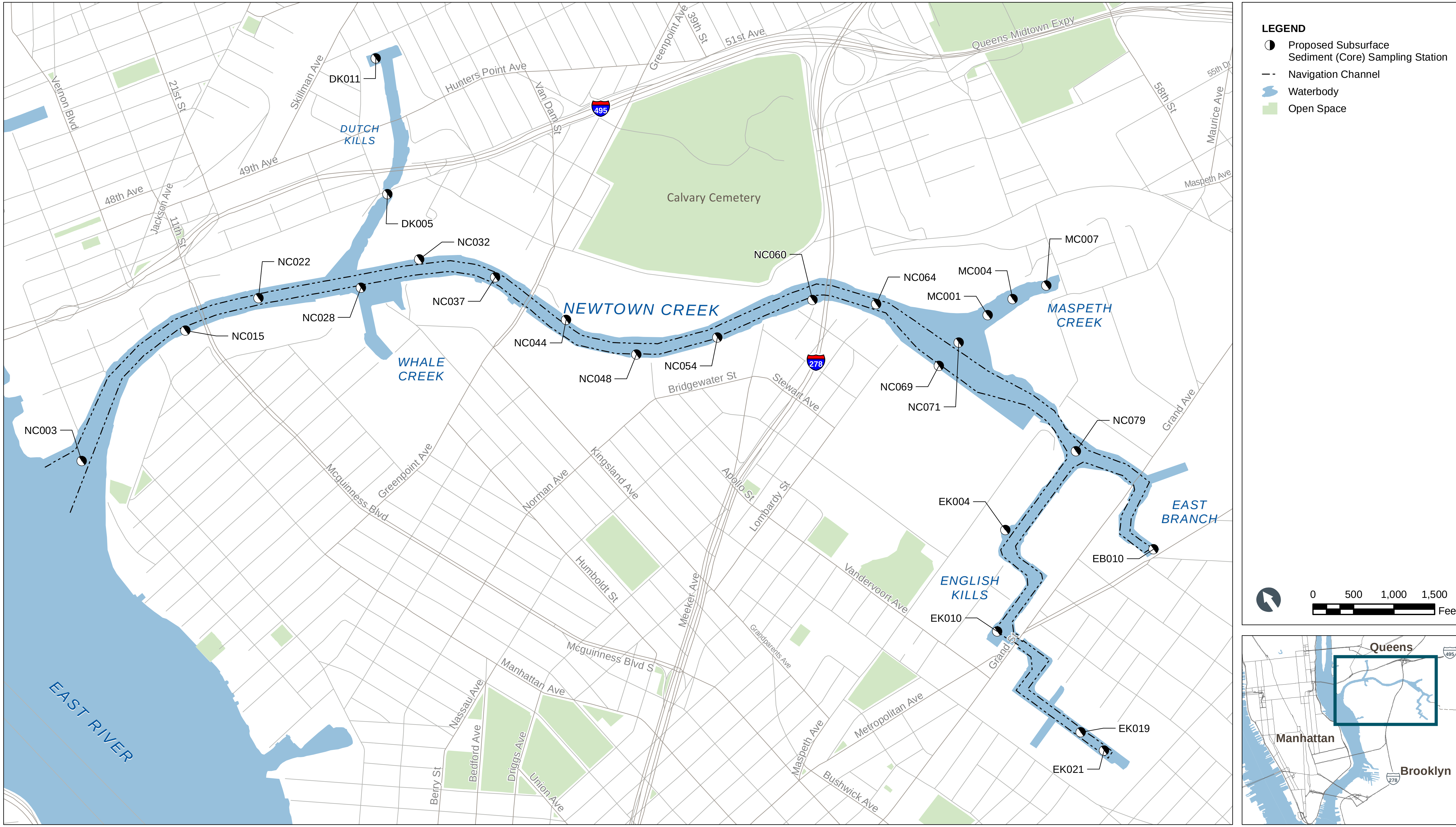
Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 8-2
Proposed Geochronology/Radioisotope Subsurface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS



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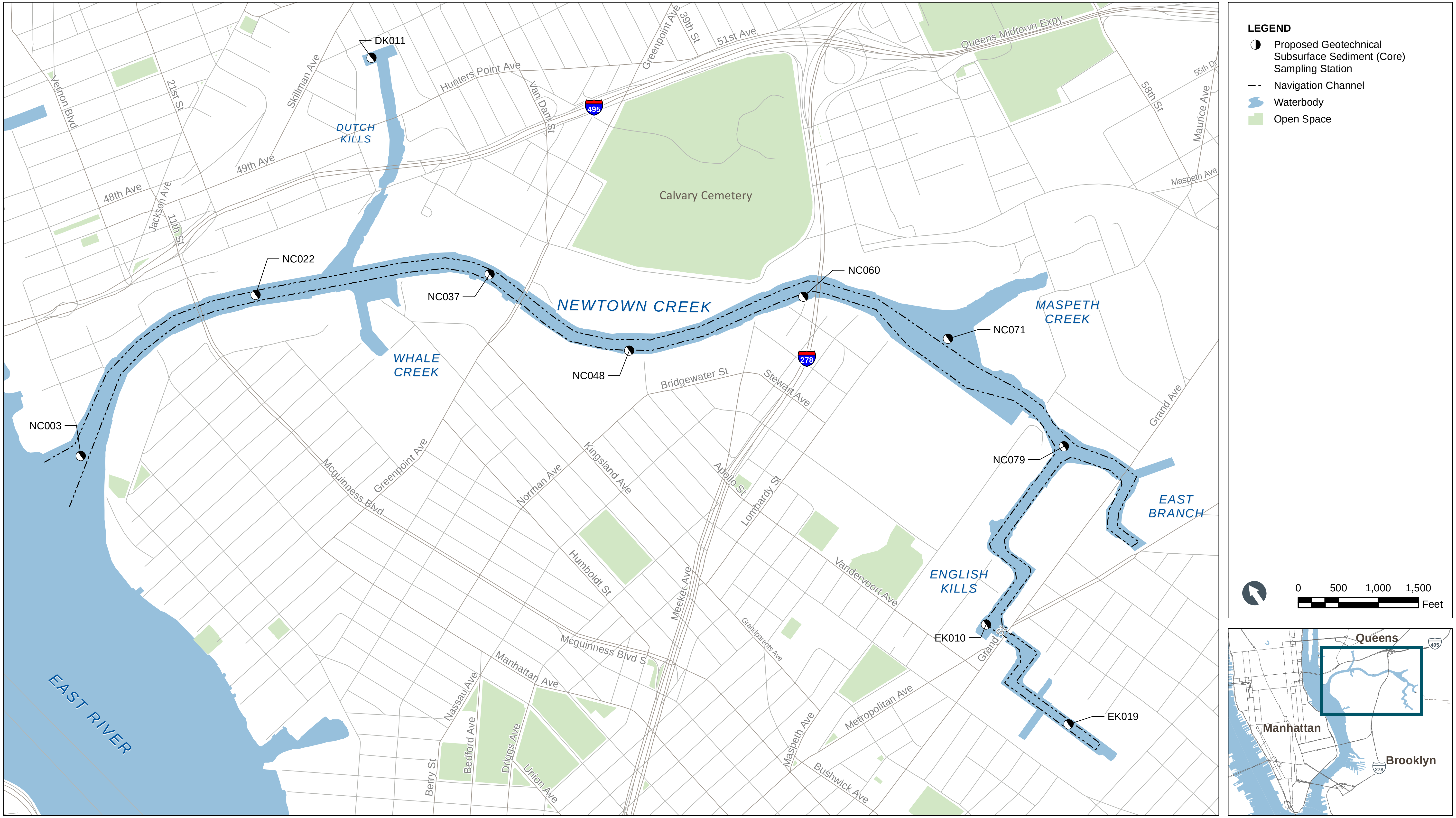
Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 8-3
Proposed Subsurface Sediment Sampling Stations for VOCs, Dioxin-Furan, Pesticides (by HRMS), PCB Congener, and Methyl Mercury
Field Sampling and Analysis Plan
Newtown Creek RI/FS



Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 8-4
Proposed Geotechnical Subsurface Sediment Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

9 SEDFLUME SAMPLING

This section describes the procedures that will be followed to perform the Sedflume sampling activities. Section 7 describes the procedures that will be followed to perform the surface sediment sampling activities. Subsurface sediment sampling procedures are provided in Section 8. Each of these sediment sampling activities will be conducted using different equipment and/or during separate mobilizations.

9.1 Overview

Purpose. Sedflume sampling will be conducted to evaluate sediment stability and support development of the sediment transport model.

Existing Data Review. Several sediment studies have been performed in the Study Area. During the OU6 investigation, a Sedflume analysis was performed on one core collected near the confluence of Maspeth Creek with Newtown Creek.

Data Gap Assessment Relative to CSM. A comprehensive analysis of sediment stability has not been conducted for the entire Study Area. This component is necessary to complete the CSM.

Summary of Work to be Performed to Close Data Gaps. This data gap will be addressed through obtaining and evaluating existing data as part of the historical data review and by conducting additional sediment stability testing (as described in this section). Additional testing of surface and subsurface sediment chemistry and geotechnical properties will also be conducted as described in Section 7 and Section 8.

SOP NC-10 – Sedflume Testing (included in Attachment 1) provides the detailed procedures for Sedflume core collection and sample testing. The following activities will be performed to conduct Sedflume sampling and testing:

- **Existing Data Review** – Review of available Sedflume data for use with the RI data
- **Sedflume Core Collection** – Collect Sedflume cores at five stations within the Study Area:

  - Collect sediment cores by direct push methodology using Sedflume-specific core collection assembly
  - Transport sediment cores to on-site testing facility
- Sedflume Sample Testing:
  - Connect sediment core to flume assembly inlet
  - Initiate water flow in flume based on testing design parameters
  - Allow water flow over surface of sediments to produce shear and cause sediment to erode
  - Continually raise sediment core in the flume inlet so the sediment-water interface remains level in the flume
  - Record erosion rates in relation to shear stress and depth
  - Collect selective sub-samples from sediment cores for bulk properties including moisture content, particle size, and bulk density

Sedflume cores will be collected at five locations. Table 9-1 provides the sampling stations and rationale for each station. Figure 9-1 shows the Sedflume core stations. These stations may be adjusted based on identification of potential utility crossings or other hazards within the Study Area; bathymetric, side-scan sonar, and magnetic surveys; shoreline survey; or field conditions. If a station needs to be moved more than 200 feet parallel to the shoreline and/or 50 feet perpendicular to the shoreline, USEPA will be notified prior to sampling. A log of the rationale for significantly moving any station will be maintained and included in monthly status reports to USEPA.

9.2 Procedures

Sedflume sampling activities are described in the following sections and detailed procedures are provided in SOP NC-10 – Sedflume Testing (Attachment 1). All of the tasks described in this section will be documented and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c). During on-water sampling activities, Study Area shoreline and waterbody conditions will be documented, along with any recreational, industrial, and ecological use of the Study Area. Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for sample form) during the sampling.

Photographs will be taken of the Sedflume cores and any significant observations made during sampling.

9.2.1 Existing Data Review

Available existing data will be researched and considered for use with evaluating the RI data. Existing Sedflume data will be obtained and reviewed. If not publically available (i.e., if Sedflume data other than the OU6 investigation data is identified), a FOIA request will be made to obtain these data. All data collected will be scanned and added to the project files.

9.2.2 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating subsurface Sedflume sediment sampling. These include:

- Ensuring that required permits and notifications for the type of sampling and locations within the Study Area have been submitted and approved for each day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the Sedflume sediment sampling.
- Obtaining utility locations for the sampling period and area within the Study Area, ensuring that all utility crossings have been identified (see Section 3), and relocating any station that is within 30 feet vertically or 50 feet horizontally from any utilities or related infrastructure.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A large boat will be used for the Sedflume sampling operations, but a small-sized boat may be necessary for some areas of the Study Area including Dutch Kills where access may be limited by fixed bridge clearance and tributary headwaters where floatables containment booms and areas of sediment accumulation may limit access to a small size boat.
- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions.
- Calibrating the multi-gas meter based on manufacturer's instructions for use during

processing.

- Preparing a daily float plan that lists a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, target station coordinates, access points along the Study Area, sample transfer/transport locations, and estimated coring depths. Target coordinates should be pre-loaded into a DGPS unit.
- Checking that water level pressure transducers are working properly.
- Obtaining final sample table from the Project Chemist that will be compiled for each sampling mobilization and organized by station. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.

During Sedflume sediment sampling and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

In addition, during the Sedflume sampling and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include: kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna

9.2.3 Sampling Activities

It is anticipated that the boat crew for Sedflume core collection activities will consist of one field team staff, the subcontractor performing the sampling, a boat captain, and crew. The boat crew will be in constant communication with the Field Team Leader during sampling activities. The boat and crew will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the coring for Sedflume analysis, the designated field team staff and subcontractor will check with the Field Team Leader to confirm the schedule and Sedflume stations and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for Sedflume core collection:

- Load all pre-cleaned sampling equipment on the boat, include decontamination fluids/equipment and IDW containers. Sample containers for opportunistic sample collection will also be loaded (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).
- Navigate the boat to the target station. The boat will be positioned and secured at the target station using procedures described in SOP NC-04 – Navigation and Boat Positioning.
- Survey coordinates (horizontal datum in NAD83 using NYLI) will be recorded for each sample attempt in the field log book and on the Sedflume Sampling Sheet in SOP NC-10 – Sedflume Testing (Attachment 1). Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy.
- Sedflume cores will be collected at each station using push core techniques to a target recovery of up to 1 m. Sedflume sampling and analysis procedures are described in SOP NC-10 – Sedflume Testing (Attachment 1).

- Once the core is retrieved, evaluate whether the core is acceptable to be retained for processing (i.e., sediment penetration depth is adequate, recovery percentage) per SOP NC-10 – Sedflume Testing (Attachment 1). If acceptable, the core will be retained for the Sedflume analysis. At some stations, more than one attempt may be required to obtain an acceptable core.
- The cores will be segmented as required for transport pending transfer to the field facility. Core segments will be kept in a vertical position at all times pending shipment to the Sedflume lab. It is anticipated that Sedflume cores will not be segmented due to anticipated core lengths of up to 1 m.
- All material from unacceptable cores, decontamination fluids, and spent PPE will be containerized as IDW and disposed of according to SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.
- All field activities will be documented, including core collection procedures and custody transfer of the cores, and all required information on the Core Collection Log will be filled out in its entirety. Field documentation procedures are detailed in Section 13 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be scanned and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files.
- At the end of the day and between stations, all sampling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination.

9.2.4 Sample Processing

Sediment cores for Sedflume analysis will be processed at the subcontractor's facility. Sediment cores will be transferred to the subcontractor's facility under COC procedures in accordance with SOP NC-13 – Sample Custody.

9.2.5 Sample Location and Frequency

Sedflume analysis will be conducted on five cores collocated with the current meter deployments. Sedflume stations are provided in Figure 9-1.

9.2.6 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. Nomenclature is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 9-1. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SF = Sedflume sediment core
- Depth = 6-character identifier indicating the depth in centimeters from where the samples were collected.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A Sedflume core sample collected at the 5th station of the main Newtown Creek area with a depth of 68 to 70 cm collected on September 8, 2011 would have the id: NC005SF-68-70-20110908.
- The duplicate of this sample would have the id: NC1005SF-68-70-20110908.

9.2.7 Sample Handling and Analysis

Sedflume samples will be collected, handled, analyzed, packaged, and shipped by the subcontractor's personnel as described in SOP NC-10 – Sedflume Testing (Attachment 1).

Samples will be packaged and shipped as described in Section13.2.3 and SOP NC-14 – Sample Packaging and Shipping.

9.2.8 Equipment Decontamination

Sedflume coring equipment will be in contact with site media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

9.2.9 Investigation-Derived Waste

IDW will be generated during the performance of the Sedflume coring and during equipment decontamination. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

9.2.10 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-10 – Sedflume Testing
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation

The subcontractor's Sedflume sampling and analysis procedures are described in Appendix C.

9.2.11 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 9-2.

9.3 Data Processing, Analysis, and Management

Electronic data collection records from Sedflume sampling, including core collection and sample management, will be downloaded as possible and saved to the electronic project files. Paper records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

The subcontractor will evaluate the collected sediments for critical shear strength. Sedflume data and geotechnical data collected during the Phase 1 RI Field Program will be used in conjunction with data collected during the historical data review to characterize sediment stability within the Study Area for use in the sediment transport model.

9.4 Reporting

Sedflume data, including the report from the subcontractor, will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

9.5 Schedule

Phase 1 RI Field Program Sedflume activities is planned to be conducted during a separate mobilization. It is anticipated that approximately 1 week will be required to collect the Sedflume samples. The schedule will be dependent on weather and field conditions.

Table 9-1
Sedflume Stations and Rationale

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale
	Easting	Northing		
EB011	1005355.2	200822.2581	East Branch, Near Confluence with Newtown Creek	- Spatially along Study Area - Near confluence of East Branch with Newtown Creek - Collocated with current meter
EK023	1004981.765	200915.0752	English Kills, Near Confluence with Newtown Creek	- Spatially along Study Area - Near confluence of English Kills with Newtown Creek - Collocated with current meter
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	- Spatially along Study Area - Near mouth of Newtown Creek - Collocated with current meter
NC081	998680.7505	208088.3368	Channel of Newtown Creek, Near Confluence with Dutch Kills and Whale Creek	- Spatially along Study Area - Near confluence of Dutch Kills and Whale Creek with Newtown Creek - Collocated with current meter
NC082	1004833.946	203112.1311	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	- Spatially along Study Area - Near confluence of Maspeth Creek with Newtown Creek - Collocated with current meter

Notes:

1 - Current meter locations are approximate and may be modified based on field conditions, access issues, etc.

NAD = North American Datum

Table 9-2
Sedflume Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Cell phone
- COC forms (electronic)
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30

Table 9-2
Sedflume Materials and Equipment

specifications/Factory Manual [FM] approved)

- Clear plastic sealing tape
- Clipboard
- Core tube plugs and caps
- Core tubes
- Coring sleeve
- Custody tape or seals
- Custody transfer forms
- Decontamination supplies (refer to NC-02 - Equipment Decontamination)
- Deionized (DI) "analyte-free" water
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Drum cart
- Drum wrench to tighten open-top drum lids
- Eckman sampler, modified Eckman sampler, modified Van Veen sampler, Petit Ponar sampler, or similar sampling device
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
- Hexane (pesticide grade or better)
- High-pressure/steam cleaner (if required)
- Ice
- IDW log form
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated containers/coolers
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Methanol (pesticide grade or better)
- Navigation charts (electronic)

Table 9-2

Sedflume Materials and Equipment

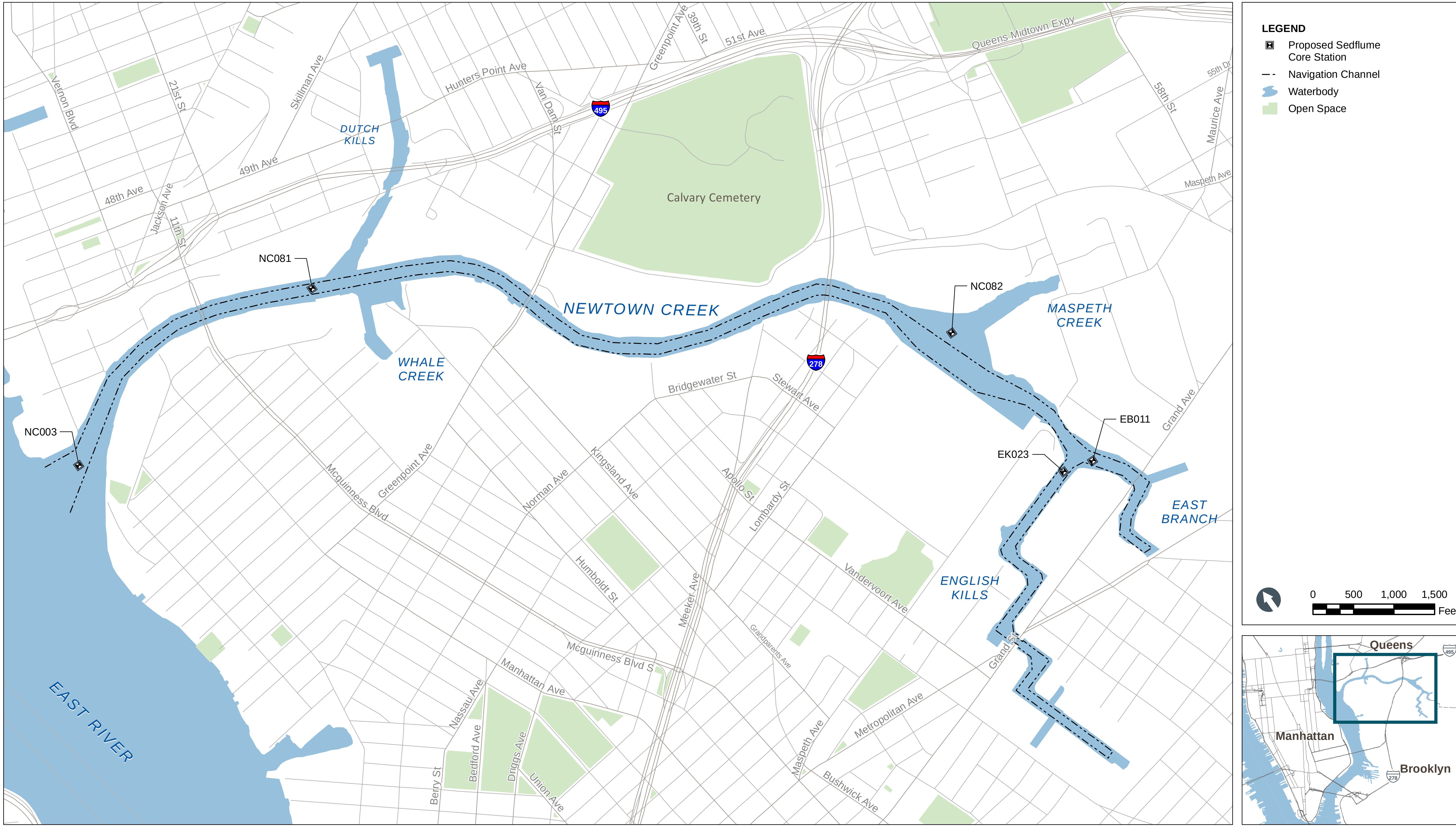
- Overnight courier airbills or shipping forms
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- PID/toxic gas sensor (refer to the HASP [Anchor QEA 2011a])
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pole to lower coring sleeve
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for equipment rinseate samples
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Ruler and tape measures
- Sample labels
- Sealing tape
- Sediment Grab Collection Record
- Shipping tape
- Siphon tubing and bucket
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Stainless steel bowls and spoons/spatulas (or equivalent)
- Stand (cradle) on which to place the grab sampler while not in deployment
- Storage racks
- Study Area maps
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Water pump and hoses (optional)
- Zipper-lock bags

See the following SOPs for further details:

Table 9-2

Sedflume Materials and Equipment

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-06 Sediment Coring Using a Vibracorer
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal
- Appendix C



Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 9-1 Proposed Sedflume Core Stations.mxd lhudson 10/14/2011 3:31:16 PM

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Note:
Proposed sampling locations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 9-1
Proposed Sedflume Core Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

10 SURFACE WATER MONITORING AND SAMPLING

This section describes the procedures that will be followed to perform the surface water monitoring and sampling activities.

10.1 Overview

The following activities will be performed to conduct the surface water monitoring and sampling:

Purpose. Surface water monitoring and sampling will be conducted along the length of the Study Area to meet the following objectives:

1. Establish chemical conditions for Study Area surface water during wet and dry weather
2. Establish physical conditions for Study Area surface water (e.g., DO, temperature, turbidity, and conductivity)
3. Provide supporting data for the fish and benthic macroinvertebrate community surveys
4. Establish a list of COPCs for consideration in the ERA and HHRA
5. Collect data on current water column conditions to support, as necessary, the future evaluation of potential short- and long-term water quality impacts associated with remedial alternatives
6. Evaluate seasonal changes in Study Area water quality (e.g., under conditions of low flow and high flow in order to complete the CSM)
7. Provide estimates of chemical and solids loading from upland sources, including flow from outfalls, overland flow, discharges from other pipes, intertidal shoreline seeps, and spills, during wet and dry weather

Existing Data Review. NYCDEP has conducted numerous investigations of water quality conditions in the Study Area, and additional resources have been identified for historical research. In addition, surface water quality data were collected during the OU6 RI.

The information reviewed to date of NYCDEP monitoring begins with the 1980 monitoring program of Newtown Creek and its tributaries in support of an application for modification of requirements for secondary treatment at the Newtown Creek WWTP under Clean Water Act Section 301 (Hazen and Sawyer 1981). In 1989 and 1990, dry and wet weather surveys and special studies were performed to characterize water quality conditions and identify sources of impairments for NYCDEP's Newtown Creek Water Quality Facility Planning Project (LMS 1991, 1992). Water quality data were also collected in Newtown Creek and its tributaries during 1993 as part of an Air Curtain Pilot Study for NYCDEP's City-Wide Floatables Study (URS 2003).

During investigations conducted over the period from 1985 to 1999, surface water samples were collected from Newtown and Maspeth Creeks. During the 1999 sampling event, copper and silver were detected in surface water samples at concentrations above corresponding water quality criteria for a Class SD surface water. However, similarly elevated concentrations of these metals have also been detected throughout the larger East River region (LMS 1992) and likely represent an area background condition.

The results of surface water sampling between 1984 and 2003 were discussed in the NYCDEP draft *City-Wide Long Term CSO Control Planning Project, Newtown Creek Waterbody/Watershed Facility Plan Report*, submitted to NYSDEC in June 2007. This report states that DO levels do not meet the SD classification for surface water. In addition, the report discusses the reduction of total and fecal coliform, which do not apply to the SD classification (no surface water contact) to target the next classification (Class I), and floatables to meet the narrative water quality standards. These constituents and the floatables are a greater issue at the headwaters of Newtown Creek and its tributaries.

Two rounds of surface water samples were collected in 2004 during the OU6 RI. Nearly all of the chemicals analyzed were either undetected or detected at maximum concentrations that were below New York State chronic water quality criteria (NYSDEC 1998). Select pesticides and a single VOC (tetrachloroethene) were detected in the water column at concentrations exceeding water quality criteria.

Data Gap Assessment Relative to CSM. A comprehensive study of surface water throughout the Study Area has not yet been conducted. In order to more fully understand the current physical and chemical conditions of Study Area surface water and develop a complete CSM, additional surface water sampling is necessary.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed by obtaining and evaluating existing data as part of the historical data review and by conducting additional surface water sampling and related analyses.

The following activities are included in the surface water monitoring and sampling activities:

- **Existing Data Review** – Review available surface water data for use with the RI data
- **Surface Water Sampling and Water Column Profili**ng – Conduct monthly surface water sampling and water column profiling for 1 year targeting wet and dry weather conditions
- **Water Column Profiling and Surface Water Sampling** – Conduct water column profiling associated with the benthic macroinvertebrate survey (see Section 12)
- **Tidal Survey Water Column Profiles** – Conduct water column profiles to characterize water quality variations over a tidal cycle
- **Shoreline Seep, Outfall, and Pipe Survey Observations** – Make observations of water discharges to the Study Area from seeps along the banks during surface water monitoring events
- **Opportunistic Sampling** – Sample select seeps, outfalls, overland flows, and discharge pipes and/or sediments in the areas of those potentially significant surface water contributions or in other areas where sediment is visually impacted during the Phase 1 RI Field Program

Phase 1 RI surface water monitoring will be conducted monthly for 1 year. After 1 year, the need for further surface water monitoring will be discussed with USEPA. It is anticipated that monthly monitoring will capture a range of conditions including seasonal dry and wet weather conditions and relatively low and high DO conditions.

The proposed monthly surface water monitoring stations are shown in Figure 10-1. The number of surface water samples and location of surface water stations may be modified based on field conditions. Surface water monitoring will also be conducted at stations co-located with the benthic macroinvertebrate community survey stations, as discussed in

Section 12. The monthly surface water monitoring stations will be sampled for general chemistry parameters (see Table 10-2); field measurements (including DO, turbidity, conductance, pH, salinity, etc.) will also be collected at each station. These stations have been selected to augment the benthic macroinvertebrate community survey stations and to provide a spatial distribution of surface water sample data. Some of the general chemistry surface water sample stations overlap with the benthic macroinvertebrate community survey stations to provide coincident data.

10.2 Procedures

Surface water sampling procedures are described in the following sections. All of the tasks described in this section will be documented, and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c). During on-water sampling activities, Study Area conditions will be documented. Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for sample form), and on data collection forms (see SOPs NC-11 – Water Column Profiling and Sampling and NC-17 – Multi-Parameter Water Quality Data Collection for sample forms) during the monitoring period. Photographs will be taken of the surface water monitoring stations and any significant observations made during sampling.

10.2.1 Existing Data Review

Available existing data will be researched and considered for use with evaluating the RI data. NYSDEC, NYCDEP, and other available, existing surface water data will be obtained and reviewed. If not publically available, a FOIA request will be made to obtain these data. All data collected will be scanned and added to the project files as described in the DMP (Anchor QEA 2011c).

10.2.2 Surface Water Sampling and Water Column Profiling

Monthly surface water sampling and water column profiling will be scheduled for the first 2 weeks of each month and will target scheduling dry and wet weather conditions, with the goal of monitoring following at least two periods of each type of condition. Weather conditions (precipitation and temperature) will be monitored prior to each sampling event at the nearest weather station with publicly available data. The dry weather target sampling condition is a period following at least 72 hours with cumulative precipitation of less than 0.1 inch (0.25 cm). The wet weather sampling condition is within 24 hours of a precipitation event of greater than 0.2 inch (0.51 cm). If this target condition is impractical, a precipitation event of 0.1 inch (0.25 cm) or greater will be sampled. After the initial quarter (i.e., three months of monitoring), the sampling conditions will be evaluated to see if the targeted conditions are met. If not, this sampling schedule will be re-evaluated.

Surface water samples will be collected from the mouth of Newtown Creek to the headwaters which, based on available data, will generally be from the areas of the least surface water contamination to areas of more surface water contamination. Surface water samples will be collected using a combination of peristaltic pump with sample tubing attached to a weighted line for the majority of samples and Kemmerer bottle for VOC samples. Water samples will be collected from the bottom up to the surface as the sample tubing is retrieved. Efforts will be made not to disturb the bottom sediment while water sampling or conducting the water column profiling. Water samples will be transferred directly from the sample tubing into laboratory-supplied containers using USEPA's "clean hands" procedures to minimize contamination (USEPA 1996). Surface water sampling procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling.

Surface water samples may also be collected using high volume sampling techniques (greater than 50 liters) for analysis of organochlorine pesticides (by high resolution mass spectrometer [HRMS]) and target compound list (TCL) dioxins and furans. The need for this sampling technique and potential sample locations will be evaluated based on the detection limits achieved during the first quarter of monthly surface water sampling (water column profiles and chemical data). If high volume sampling will be conducted, an FSAP addendum will be prepared to describe this activity.

During surface water sampling and water column profiling and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

In addition, during surface water sampling and water column profiling and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include kayaking or other non-commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

10.2.2.1 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating surface water sampling and water column profiling. These activities include:

- Ensuring that required permits and notifications for the type of sampling and stations within the Study Area have been submitted and approved for each day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the hydrographic surveys.
- Obtaining utility locations for the sampling period and area within the Study Area and ensuring that all utility crossings have been identified.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A small boat is recommended to complete the surface water sampling and water profiling activities.
- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the 72 hours prior to sampling to determine if the sampling is being conducted under dry weather or wet weather conditions.
- Checking weather conditions for the day prior to leaving the dock and throughout

the day for changing conditions.

- Obtaining final sample table from Project Chemist that will be compiled for each sampling mobilization and organized by station. This table will include station number, analyses to be conducted, QA/QC samples required, holding times, preservation, and the laboratory address. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.
- Calibrating the multi-parameter sonde for DO, temperature, salinity, conductivity, pH, turbidity, and depth.
- Preparing a daily float plan that lists a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, target station coordinates, access points along the Study Area, and sample transfer/transport locations. Target coordinates should be pre-loaded into a DGPS unit.

10.2.2.2 Sampling Activities

It is anticipated that the boat crew for surface water sampling and water column profiling will consist of three to four field team staff, including a boat captain and two to three crew members. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of sampling, the designated field team staff will check in with the Field Team Leader to confirm the schedule and stations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for surface water sampling and profiling activities:

- Load all pre-cleaned sampling and profiling equipment on the boat, including decontamination fluids/equipment and IDW containers, and place fresh ice in the sample holding containers. Should the sampling boat be of insufficient size to accommodate the required sample containers, a support boat will be used to transport containers and collected samples (under COC) as necessary. Additional sample containers will be available for opportunistic sample collection (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).

- Navigate the boat to the target station. The boat will be positioned at the target station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each sample station on the Surface Water Sample Record included in SOP NC-11 – Water Column Profiling and Sampling. Data will be obtained with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy.
- Care will be taken not to disturb/contact sediments during collection of water samples since any entrainment of sediment into a water sample will result in non-representative results.
- Water column profile data will be measured with a multi-parameter sonde capable of logging DO temperature, salinity, conductivity, pH, turbidity, and depth. Upon arriving at the sample station, the depth to mudline will be measured using the on-board fathometer. An accurate measurement with a weighted water level meter, tape, or other depth measurement device will be made once all samples are collected. A secondary approximate measurement referring the sampling vessels sonar will also be conducted. Water quality measurements will be recorded at the water surface (approximately 6-inch [15-cm] depth) and at 1-foot (30-cm) intervals until approximately 1 foot (30 cm) above the mudline. Water quality measurement procedures and sample forms (Water Quality Data Log and Surface Water Sample Collection Record) are provided in SOP NC-11 – Water Column Profiling and Sampling. Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy, or equivalent equipment. In addition to the manual water quality measurements, the multi-parameter sonde will be operated in the logging mode for a continuous record of the water quality measurements. This continuous record will be downloaded as possible.
- Following collection, the water column profile data will be reviewed for stratification (i.e., a sharp change in field parameters measured, estimated at greater than 20% of

the total range of the field parameter measurements, to be confirmed in the field).

- If no stratification is observed (i.e., based on temperature, salinity, DO, and turbidity profiles) or if two water types are observed and when water depth is sufficient (i.e., 5 feet or deeper), surface water samples will be collected from two depths at each surface water sampling station. One surface water sample will be collected just below the water surface (approximately 1 meter [3.28 feet] below the water surface). One deeper sample will be collected at approximately 0.6 m (2 feet) above the mudline except in areas where significant slopes or contact with the sediments is a significant concern, in which case the sample will be collected at 1 m (3.28 feet) above the mudline.
- If more than two distinct water types are observed, one additional sample will be collected for each additional water type. These additional samples will be collected from the midpoint of the water type.
- When water depth is less than 5 feet deep, and no stratification is observed, one surface water sample will be collected. This sample will be collected from the midpoint in the water column. However, if stratification is observed, a sample will be collected of each layer.

- Surface water samples for all analyses (excluding VOCs) will be collected using a peristaltic pump with the sample tubing attached to a weighted line. Surface water samples for VOCs will be collected using a Kemmerer bottle at the same water depth as the samples collected by peristaltic pump as described in SOP NC-11 – Water Column Profiling and Sampling. Water samples will be collected from the bottom up to the surface at each discrete sample depth as the line is retrieved. Water samples will be transferred directly from the sample tubing through the peristaltic pump into laboratory-supplied containers (refer to sample table provided by Project Chemist) using USEPA's "clean hands" procedures to minimize contamination. Water samples collected by Kemmerer bottle will be poured directly into laboratory-supplied containers (refer to sample table provided by Project Chemist) using USEPA's "clean hands" procedures to minimize contamination. Surface water sampling procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. Following collection into the laboratory-supplied container, the surface water samples will be placed in a cooler at 4°C for transport to the field facility where they will be packaged for shipment.

- All field activities will be documented, including sampling and profiling activities, and the Surface Water Sample Collection Record and Water Quality Data Log (see SOP NC-11 – Water Column Profiling and Sampling) will be filled out in their entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded at the end of each day they are collected and saved to the project files. At the end of the day and between sample intervals, the multi-parameter sonde will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next use.

10.2.2.3 Sample Processing

Surface water samples will be processed on the boat at the time of sampling and then transported to the field facility for packing and shipping. Samples will be transferred from the sample custodian on the boat to a sample custodian on the shore from the field facility per SOP NC-13 – Sample Custody. Once samples are received at the field facility, the samples will be checked and the information will be entered onto a COC Record for transport to the laboratory per SOP NC-13 – Sample Custody. Sample containers will be stored at 4°C pending shipment to the laboratory per SOP NC-14 – Sampling Packaging and Shipping. Sample handling and shipping procedures are discussed in Section 13.2.

10.2.2.4 Station Location and Frequency

Surface water sampling will be conducted monthly targeting both dry and wet weather conditions. Figure 10-1 shows the surface water sample and water profiling stations.

10.2.2.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. Nomenclature is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 10-1.

The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:

  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills

- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SW = Surface water
  - RB = Rinsate blank
  - TB = Trip blank
- Depth:
  - Depth, water = Surface waters will be designated by three depth indicators:
    - A = Near surface (or only sample depth if collected in less than 5 feet of water)
    - B = Middle
    - C = Near bottom
  - The actual depth of collection will be recorded on water sample collection forms and loaded into the project database.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A surface water sample collected in the upper water column of Maspeth Creek at the first station on May 16, 2012 would have the id: MC001SW-A-20120516
- A rinsate blank collected in association with surface water sampling collected on June

1, 2012 would have the id: SW-RB-20120601

10.2.2.6 Sample Handling and Analysis

Surface water samples will be analyzed for a broad list of constituents identified in the RI/FS Work Plan Table 4-5 and summarized by analysis in Table 10-1 and in QAPP (Anchor QEA 2011b) Worksheet #20 (Field Quality Control Sample Summary Table). Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

10.2.2.7 Equipment Decontamination

Surface water sampling equipment will be in contact with site media and, therefore, will require decontamination. Equipment will be decontaminated between sample stations and at the end of each day. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

10.2.2.8 Investigation-Derived Waste

IDW will be generated during the performance of the surface water sampling equipment decontamination. PPE will also be generated as IDW. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

10.2.2.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-11 – Water Column Profiling and Sampling
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal

- NC-16 – Photoionization Detector Calibration and Operation
- NC-17 – Multi-Parameter Water Quality Data Collection

10.2.2.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 10-3.

10.2.3 Tidal Survey Water Column Profiling

Tidal survey water column profiles will be performed at three locations within the Study Area during one survey event following the first quarter of sampling to characterize water quality variations over a tidal cycle. If daylight hours permit, the tidal survey water column profiling will be conducted for one 13-hour period from either high to high tide or from low to low tide. If the daylight hours do not permit one 13-hour tidal survey, the survey will be conducted as two 7-hour periods over the course of two days from either high to low tide or low to high tide. A multi-parameter sonde will be used to obtain measurements for water column stratification (temperature, salinity, DO, and turbidity profiles) and basic water quality parameters (pH, total water depth, and conductivity) in accordance with SOP NC-11 – Water Column Profiling and Sampling and NC-17 – Multi-Parameter Water Quality Data Collection. Profiles will be measured at the water surface (approximately 6-inch [15-cm] depth) and at 1-foot (30-cm) intervals until approximately 1 foot (30 cm) above the mudline. Water column profiles will be measured throughout the tidal cycle at 2 hour intervals at each tidal profiling station. These measurements, along with observations noted during sampling activities (e.g., water visibility, odor, and color), will be recorded on a Water Quality Data Log (see SOP NC-11 – Water Column Profiling and Sampling).

10.2.3.1 Pre-Profiling Activities

Pre-profiling activities will be completed prior to initiating tidal survey water column profiling. These activities include:

- Ensuring that required permits and notifications for the type of sampling and stations within the Study Area have been submitted and approved for the day's activities (see Table 3-1).

- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the profiling activities.
- Obtaining utility locations for the sampling period and area within the Study Area and ensuring that all utility crossings have been identified.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A small boat is recommended to complete profiling operations.
- Checking tide charts to establish profiling period.
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions.
- Calibrating the multi-parameter sonde for DO, temperature, salinity, conductivity, pH, turbidity, and depth.
- Preparing a daily float plan that lists a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, target station coordinates, and access points along the Study Area. Target coordinates should be pre-loaded into a DGPS unit.

10.2.3.2 Profiling Activities

It is anticipated that the boat crew for surface water column profiling activities will consist of three field team staff, including a boat captain and a two crew members, as needed. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of tidal profiling, the designated field team staff will check in with the Field Team Leader to confirm the schedule and stations to be profiled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for surface water profiling activities:

- Load all pre-cleaned profiling equipment on the boat, including decontamination fluids/equipment and IDW containers.
- Navigate the boat to the downstream profile station. The boat will be positioned at the profile station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each profile station on the Water Quality Data Log in SOP NC-11 – Water Column Profiling and Sampling. Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy.
- Water column profile data will be measured with a multi-parameter sonde capable of logging DO, temperature, salinity, conductivity, pH, turbidity, and depth. Prior to obtaining profile water quality data, the depth to mud line will be measured with a weighted water level meter, tape, or other depth measurement device. A secondary approximate measurement referring the sampling vessels sonar will also be conducted. Water quality measurements will be recorded at the water surface (approximately 6-inch [15-cm] depth) and at 3-foot (91-cm) intervals until approximately 1 foot (30 cm) above the mudline. Water quality measurement procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy, or equivalent. In addition to the manual water quality measurements, the multi-parameter sonde will be operated in the logging mode for a continuous record of the water quality measurements. This continuous record will be downloaded as possible.
- This procedure—from downstream, to midstream, to upstream—will be continuously repeated as possible throughout the tidal cycle measurement period.
- Calibration checks of field instruments will be conducted as needed where readings are suspect to produce accurate and reproducible data.
- Field instruments will be recalibrated at the end of the field day to confirm that the instrument functioned properly throughout the day and to provide information to assess drift, if any, occurring the period of operation.

- All field activities will be documented including profiling procedures and all required information on the Water Quality Data Log will be filled out in its entirety. Field documentation procedures are detailed in Section 13 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded at the end of each day they are collected and saved to the project files. At the end of the day, the profiling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next day.

10.2.3.3 Sample Processing

No samples will be collected as part of the tidal survey water column profiling.

10.2.3.4 Profile Location and Frequency

The tidal survey profile stations will be identified after 3 months (i.e., one quarter, of monthly water quality monitoring). This monitoring data (e.g., variation in salinity, DO, and temperature that may indicate the range and signature of tidal flows), will be used to provide a preliminary indication of tidal influence within the Study Area. Conceptually, tidal survey profile stations will be located as follows: one in the lower reaches of the Study Area, one in the mid-reaches of the Study Area, and one in the upper reaches of the Study Area.

10.2.3.5 Profile Designation

A tidal survey profile station for the Phase 1 RI Field Program is. {station identification}{matrix code}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 10-1. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills

  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills

- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - TP = Tidal Profile
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A tidal profile collected at the surface of Maspeth Creek at the first station on May 16, 2012 would have the id: MC001TP-20120516

10.2.3.6 Sample Handling and Analysis

No samples will be collected as part of the tidal survey water column profiling. The data from the tidal survey will be collected electronically, see Section 10.3.

10.2.3.7 Equipment Decontamination

Tidal survey water column profiling equipment will be in contact with site media and, therefore, will require decontamination. The equipment will not be decontaminated between stations, but will be decontaminated at the end of each day that tidal survey water column profiling is performed. Decontamination of the equipment will be performed in accordance with the procedures described in this FSAP and SOP NC-02 – Equipment Decontamination.

10.2.3.8 Investigation-Derived Waste

IDW will be generated during the performance of equipment decontamination. PPE will also be generated as IDW. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

10.2.3.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-11 – Water Column Profiling and Sampling
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-17 – Multi-Parameter Water Quality Data Collection

10.2.3.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 10-3.

10.2.4 Opportunistic Sampling

Opportunistic sampling of select seeps, outfalls, overland flows, and discharge pipes in the areas of those potentially significant surface water contributions will be conducted during the Phase 1 RI Field Program. Locations for the collection of these samples will be identified based on the results of the surveys (including the shoreline assessment, hydrographic survey and aerial photography survey) and will be focused on pipes (particularly pipes where permits have not been identified) or overland flows with significant discharge volumes and showing visual signs of contamination (e.g., discoloration or sheens).

Opportunistic sampling of water (i.e., pipes, seeps, and overland flows), will be conducted when flows are observed. These water samples will be collected the first time they are observed. Following collection, there will be a discussion among the RI Manager, Respondents, and USEPA concerning whether the samples will be submitted for analysis and the constituents to be analyzed. Prior to conducting any opportunistic sampling, health and safety conditions for sampling will be evaluated and a THA prepared.

10.2.4.1 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating opportunistic sampling. These activities include:

- Ensuring that required permits and notifications for the type of sampling and locations within the Study Area have been submitted and approved for the day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the profiling activities.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A small boat will be used to complete the surface water sampling and water profiling activities.
- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions.
- Calibrating the multi-gas meter for use on board the boat.
- Calibrating the multi-parameter sonde for DO, temperature, salinity, conductivity, pH, turbidity, and depth.
- Preparing a daily float plan that lists a plan for communication between the land-side and boat-based field team staff, the stations to be sampled, target station coordinates, access points along the Study Area, sample transfer/transport locations, and estimated coring depths. Target coordinates should be pre-loaded into a DGPS unit.
- Obtaining final sample table from Project Chemist that will be that will include analyses to be conducted, QA/QC samples required, holding times, preservation, and the laboratory address. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.

10.2.4.2 Sampling Activities

It is anticipated that the boat crew for opportunistic sampling will consist of two field team staff, including a boat captain and a one crew member, as needed. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of sampling, the designated field team staff will check with the Field Team Leader to confirm the schedule and stations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for surface water sampling and profiling activities:

- Load all pre-cleaned sampling and profiling equipment on the boat, including decontamination fluids/equipment and IDW containers, and place fresh ice in the sample holding containers. Should the sampling boat be of insufficient size to accommodate the required sample containers, a support boat will be used to transport containers and collected samples (under COC) as necessary. Sample containers for opportunistic sample collection will also be loaded (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).
- Navigate the boat to the target station. The boat will be positioned at the target station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each sample station on the Opportunistic Sample Record included in SOP NC-11 – Water Column Profiling and Sampling. Data will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy. Opportunistic water samples from pipes, seeps, and overland flow will include field measurements of water quality measured with a multi-parameter sonde capable of logging DO, temperature, salinity, conductivity, pH, and turbidity. Data will be collected on a Panasonic Toughbook® handheld tablet computer, or similar, with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy, or equivalent.
- Opportunistic water samples from pipes, seeps, and overland flow will be collected directly into sample containers. At each station, a clean unused sample container will

be used to collect the water sample, and then the water will be transferred into the laboratory-supplied containers using USEPA's "clean hands" procedures to minimize contamination. Care will be talked to obtain a sample as free of turbidity as possible given sampling conditions. For seeps and overland flow samples, it may be necessary to construct a small depression in the shoreline to allow for the accumulation of water collection. Following collection, the water samples will be stored on ice in a cooler at 4°C for transport to the field facility where they will be packaged for shipment. All field activities will be documented, including sampling and profiling procedures, and all required information on the Water Collection Record will be filled out in its entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.

- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files. At the end of the day, the multi-parameter sonde will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next day.

10.2.4.3 Sample Processing

Opportunistic samples will be processed on the boat at the time of sampling and then transferred to the field facility for packaging and shipment. Samples will be transferred from the sample custodian on the boat to a sample custodian on the shore from the field facility using a Custody Transfer Form per SOP NC-13 – Sample Custody. Once samples are received at the field facility, the samples will be checked and information will be entered onto a COC Record for transport to the laboratory per SOP NC-13 – Sample Custody. Sample containers will be placed in a cooler at 4°C pending shipment to the laboratory per SOP NC-14 – Sampling Packaging and Shipping. Sample handling and shipping procedures are discussed in Section 13.2.

10.2.4.4 Station Location and Frequency

Station location and frequency will be determined by the shoreline assessment.

10.2.4.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. Nomenclature is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 10-1. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. For opportunistic samples, the field crew will assign sequential locations numbers and will record these on field forms. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SW = Surface water
  - RB = Rinsate blank
  - TB = Trip blank
- Depth = Surface waters will be designated by three depth indicators:
  - A = Near surface
  - B = Middle
  - C = Near bottom
  - The actual depth of collection will be recorded on water sample collection forms and loaded into the project database.

- Date = 8-character code to indicate the date the sample was collected in the format

YYYYMMDD.

Examples:

- A surface water sample collected in the upper water column of Maspeth Creek at the first station on May 16, 2012 would have the id: MC001SW-A-20120516
- A rinsate blank collected in association with chemistry core sampling collected on June 1, 2012 would have the id: SC-RB-20120601

10.2.4.6 Sample Handling and Analysis

Opportunistic water samples will be analyzed for the general chemical list of parameters (see Table 10-2).

Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3.

10.2.4.7 Equipment Decontamination

Opportunistic sampling equipment will be in contact with site media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

10.2.4.8 Investigation-Derived Waste

IDW will be generated during the performance equipment decontamination. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

10.2.4.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning

- NC-11 – Water Column Profiling and Sampling
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation

10.2.4.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 10-3.

10.3 Data Processing, Evaluation, and Management

Electronic data collection records, including tidal survey profiles and water column profiles will be downloaded as possible and saved to the project files. Paper records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

The data collected the surface water sampling activities and opportunistic sampling will be stored in the project files. Analytical data will be validated in accordance with USEPA Region 2 data validation protocols as described in the QAPP (Anchor QEA 2011b) Worksheets #35 (Sampling and Analysis Validation [Steps IIa and IIb] Process Table), #36 (Sampling and Analysis Validation [Steps IIa and IIb] Summary Table), and #37 (Data Usability Assessment). Analytical data will be maintained the project database and accessible only by designated project personnel as described in the DMP (Anchor QEA 2011c).
The data will be evaluated to describe chemical and physical conditions for Study Area surface water during wet and dry weather and seasonally and to establish a list of COPCs for consideration in the ERA and HHRA. Based on the results of the surface water monitoring, estimates of chemical and solids loading from upland sources over wet and dry seasons will be provided. The data will also be used to support, as necessary, the future evaluation of potential short- and long-term water quality impacts associated with remedial alternatives.

The opportunistic sampling data will be used, along with the historical research, to identify potential upland sources. This information will be provided to USEPA for potential further upland investigation. This information will also be considered in the design of the Phase 2 RI Work Plan.

10.4 Reporting

Information obtained during surface water sampling, tidal profiling, and opportunistic sampling will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate. The opportunistic sampling data will be provided to USEPA for potential further upland investigation. This information will also be considered in the design of the Phase 2 RI Work Plan.

10.5 Schedule

The surface water monitoring program is planned to be conducted after the completion of the shoreline assessment and hydrographic survey tasks. The monthly sampling and profiling events are intended to be performed during the first full week of each month over the course of 1 year. Monthly surface water monitoring will include targeting both dry and wet weather conditions, with the goal of monitoring following at least two periods of each. The dry weather target sampling condition is a period following at least 72 hours with a cumulative precipitation of less than 0.1 inch (0.25 cm). Wet weather monitoring will be initiated within 24 hours of a precipitation event of greater than 0.2 inch (0.5 cm). If this target condition is impractical, a precipitation event of 0.1 inch (0.25 cm) or greater will be sampled. The schedule will be modified if target conditions cannot be met during the first full week of a month. Precipitation and temperature will be determined at the nearest weather station with publicly available data.

The tidal survey will be scheduled after one quarter (i.e., three monthly rounds), of surface water sampling.

The schedule for each of these activities will also be dependent on weather and field conditions.

Opportunistic sampling will be conducted following completion of the shoreline assessment and it is anticipated that it will occur during the second quarter of surface water sampling. However, opportunistic sampling may occur at any time during the Phase 1 RI Field Program.

Table 10-1
Surface Water Monitoring and Sampling Stations, Rationale, and Analysis

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses [2,3]
	Easting	Northing			
DK001	999113.4979	208040.1951	Dutch Kills at Confluence with Newtown Creek	- Spatially along Study Area	Surface Water Chemical-All List
DK011	1001089.061	209964.0173	Head of Dutch Kills	- Spatially along Study Area - Near head of tributary where sediment loading is occurring	Surface Water Chemical-All List
EB010	1005320.943	199517.815	Head of East Branch	- Spatially along Study Area - At head of tributary where loading is occurring	Surface Water Chemical-All List
EK006	1003877.273	200501.5462	Near Shoreline of English Kills, Lower Reach	- Spatially along Study Area	Surface Water Chemical-All List
EK014	1003024.957	198993.8115	Channel of English Kills, Upper Reach	- Spatially along Study Area	Surface Water Chemical-All List
EK022	1003573.9	197514.9193	Head of English Kills	- Spatially along Study Area - At head of tributary in area where sediment loading is occurring	Surface Water Chemical-All List
MC008	1006256.261	202893.7419	Head of Maspeth Creek	- Spatially along Study Area - At head of tributary in area where sediment loading is occurring	Surface Water Chemical-All List
NC007	995680.9649	208329.6693	Channel of Newtown Creek, Lower Reach, Near Confluence with East River	- Spatially along Study Area	Surface Water Chemical-All List
NC020	997722.769	208494.0163	Channel of Newtown Creek, Lower Reach	- Spatially along Study Area	Surface Water Chemical-All List

Table 10-1
Surface Water Monitoring and Sampling Stations, Rationale, and Analysis

Station ID	Target Coordinates NAD 83[1] (feet)		Location in Study Area[1]	Rationale	Analyses[2,3]
	Easting	Northing			
NC034	1000311.677	207284.2389	Channel of Newtown Creek, Middle Reach	- Spatially along Study Area - Near Respondent property, center of dredged channel	Surface Water Chemical-All List
NC046	1001141.355	205537.0667	Channel of Newtown Creek, Middle Reach	- Spatially along Study Area - Near Respondent property	Surface Water Chemical-All List
NC068	1004634.763	203543.5857	Near Shoreline of Newtown Creek, Upper Reach, Near Confluence with Maspeth Creek	- Spatially along Study Area - Near Respondent property	Surface Water Chemical-All List
NC070	1004730.236	202892.8872	Channel of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	- Spatially along Study Area	Surface Water Chemical-All List
NC079	1005252.387	200965.302	Channel of Newtown Creek, at Confluence with English Kills and East Branch	- Spatially along Study Area	Surface Water Chemical-All List
WC001	999182.8784	207694.0858	Whale Creek at Confluence with Newtown Creek	- Spatially along Study Area	Surface Water Chemical-All List

Notes:

1 - Sampling locations are approximate and may be modified based on field conditions, access issues, etc.

2 - 25% percent of surface water samples will be analyzed for PCB congeners.

3 - Surface Water Chemical-All refers to general chemistry and physical parameters shown in Table 10-2.

NAD = North American Datum

Table 10-2
Surface Water Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (mL)	Container	Preservation Requirements	Lab	Number of Locations	Volume To Specific Labs	Preservative
Surface Water Chemical-All							
PAHs and alkyl PAHs (8270C/D-SIM)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	15	2000mL	0-6°C; store in the dark
n-Alkanes and Isoprenoids Including DRO and TPH Ranges (8015 Modified)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark		15		
Phosphorus (Total and Dissolved; SM4500)	250	250 mL HDPE	0-6°C; 0.5 mL H_2SO_4 per 250 mL container		15	250mL	0-6°C; 0.5 mL H_2SO_4 per 250 mL container
TCL VOCs plus TICs (8260B)	120	3x 40 mL septum sealed VOA vials	0-6°C; hydrochloric acid (HCl) to pH<2, store in the dark.		15	120mL	0-6°C; hydrochloric acid (HCl) to pH<2, store in the dark.
Ammonia-N (350.1)	100	125 mL HDPE	0-6°C; H_2SO_4 to pH < 2		15	320mL	0-6°C; H2SO4 to pH < 2
Nitrate/Nitrite (353.2)	100	100 mL HDPE			15		
TOC (SM5310C)	120	3 x 40 ml VOA vial			15		
Alkalinity (SM2320B)	100	250 ml HDPE	0-6°C		15	250mL	0-6°C
Anions (Bromide, Chloride, Sulfate; 300.0)	150	500 mL HDPE	0-6°C		15		
Cyanide (9010B)	500	500 mL HDPE	0-6°C; NaOH to pH > 12		15	500mL	0-6°C; NaOH to pH > 12
TAL Metals plus Tin (Total and Dissolved; 6010B/6020/1638)	1000	Metals (including tin): 1 L HDPE	0-6°C Nitric acid to pH<2		15	1000mL	0-6°C Nitric acid to pH<2

Table 10-2
Surface Water Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (mL)	Container	Preservation Requirements	Lab	Number of Locations	Volume To Specific Labs	Preservative
Hardness (calculated)	Calculated from Total TAL Metals Analysis	Included with Total TAL Metals	Included with Total TAL Metals	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048			
DOC (SM5310C)	200	3 x 250 mL glass	0-6°C; store in the dark		15	750mL	0-6°C; store in the dark
Nitrogen (Total and Dissolved; Alpha TKN + NO3/NO2)	200	3 x 250 mL HDPE	0-6°C		15	750mL	0-6°C
POC (9060 Modified/Lloyd Kahn with filtrate)	750	3 x 300 mL HDPE	0-6°C; store in the dark		15	900mL	0-6°C; store in the dark
TDS (160.1)	1000	1 L HDPE	0-6°C		15	1000mL	0-6°C
TSS (160.2)[1]	1000	1 L HDPE	0-6°C		15	1000mL	0-6°C
SSC (ASTM 3977)[1]	1000	One tared 1 L HDPE	0-6°C; store in the dark; weigh entire sample bottle to nearest 0.1 g and record weight upon receipt at laboratory	GeoTesting Express 1145 Massachusetts Avenue Boxborough, MA 01719	15	1000 mL	0-6°C; store in the dark; weigh entire sample bottle to nearest 0.1 g and record weight upon receipt at laboratory
Total Volume (mL)	**5590**					**8590mL**	
Total and Dissolved Mercury (1631)	250	Mercury: 250 mL PTFE	0-6°C, BrCl in excess until yellow color is evident or test using starch iodide paper	Brooks Rand Laboratory 3958 6th Ave NW Seattle, WA 98107	15	250mL	0-6°C, BrCl in excess until yellow color is evident or test using starch iodide paper
Methyl Mercury (1630 Modified)	2000	250 – 2x1 L Fluoropolymer or Borosilicate Glass	0-6°C; freshwater 4-5 mL 11.6 M HCl; saline 2 mL/L 9 M sulfuric acid (H_2SO_4)		15	2000mL	0-6°C; freshwater 4-5 mL 11.6 M HCl; saline 2 mL/L 9 M sulfuric acid (H_2SO_4)
Total Volume (mL)	**2250**					**2250mL**	

Table 10-2
Surface Water Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (mL)	Container	Preservation Requirements	Lab	Number of Locations	Volume To Specific Labs	Preservative
BOD_5	1000	1000 mL HDPE or glass	0-6°C	EnviroTest Laboratory 315 Fullerton Avenue Newburgh, NY 12550	15	1000mL	0-6°C
BOD_{30}	2000	2 x1000 mL HDPE or glass			15	2000mL	
Total and Fecal Coliform	100	125 mL HDPE	0-6°C		15	100mL	
Total Volume (mL)	**3100**					**3100mL**	
TCL SVOCs plus TICs and 1,4-dioxane (8270C/D)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark	TestAmerica 301 Alpha Drive Pittsburgh, PA 15238	15	4000mL	0-6°C; store in the dark
Chlorinated Herbicides (8151A)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark		15		
TCL PCBs Aroclors (8082)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark		15		
NOAA Organochlorine Pesticides (8081A)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark		15		
Total Volume (mL)	**4000**					**4000mL**	
Surface Water Chemical-Select							
209 PCB Congeners and Homolog Groups (1668A)	1000	1 L amber glass with PTFE lined lid	0-6°C; store in the dark	SGS North Americad 5500 Business Drive, Wilmington, NC 28405	4	1000mL	0-6°C; store in the dark
Total Volume (mL)	**1000**					**1000mL**	
Surface Water Chemical-Supplemental							
PIANO VOCs (8260 Modified)	120	3x 40 mL septum sealed VOA vials	0-6°C; hydrochloric acid (HCl) to pH<2, store in the dark.	Alpha Analytical Woods Hole Division 320 Forbes Boulevard Mansfield, MA 02048	TBD	120mL	0-6°C; hydrochloric acid (HCl) to pH<2, store in the dark.

Notes:

1 Either TSS or SSC will be collected at each of the 15 stations.

Table 10-3

Surface Water Monitoring Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Barometer (if instrument is not configured to measure value)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Buoy, instrument caging, and connector deployment cable/chain
- Calibration standards:
  - Conductivity standard appropriate for field conditions expected
  - Dissolved oxygen (DO) kit (electrolyte solution and Teflon® membranes)

Table 10-3

Surface Water Monitoring Materials and Equipment

  - Oxidation-reduction potential (ORP) standard solution (Zobell solution)
  - pH 4.0, 7.0, and 10.0 standard buffer solutions
  - Turbidity standard

- Cell phone
- CFLEX™ or equivalent polymer tubing (typical configuration requires 3/8 inch ID)
- COC forms (electronic)
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30 specifications/Factory Manual [FM] approved)
- Chemical-free paper towels
- Chemical-free wipes
- Clear plastic sealing tape
- Clipboard
- Connective (serial) cabling and data logger
- Conductivity, temperature, depth (CTD)/turbidity instrument package (OBS3A or equivalent)
- Custody tape or seals
- Decontamination supplies (refer to SOP NC-02 - Equipment Decontamination)
- Deionized (DI) "analyte-free" water
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Digital thermometer
- Drum cart
- Drum wrench to tighten open-top drum lids
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- Filter supports/holders
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Forceps
- Glass fiber filters (GF/Fs), generally (pre-combusted) 25mm for POC
- Hand-held electronic recording device (optional)

Table 10-3

Surface Water Monitoring Materials and Equipment

- Ethyl acetate
- Hi-flow water pump (diaphragm pump ca. 10 L/min or better; Shurflo™ or equivalent)
- High-pressure/steam cleaner (if required)
- Ice
- IDW log form
- If station requirements are limited to turbidity, or pressure, then individual turbidity or pressure sensing systems (e.g., HOBO™ or equivalent) will be needed
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated coolers
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Manufacturers operating manual
- Marine VHF (high frequency) radio
- Meter probe cable (minimum 30-foot length)
- Methanol (pesticide grade or better)
- Multi-parameter Water Quality Meter (YSI, Horiba, or equivalent) equipped with probes for temperature, salinity, DO, pH, turbidity, and conductivity
- Navigation charts and sampling locations figure
- Overnight courier airbills or shipping forms
- Pallets
- Peristaltic pump (for low-flow sampling)
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-cleaned Wheaton-33™ low extractable borosilicate glass vials (40-mL) or equivalent
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for equipment rinsate samples
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional).

Table 10-3

Surface Water Monitoring Materials and Equipment

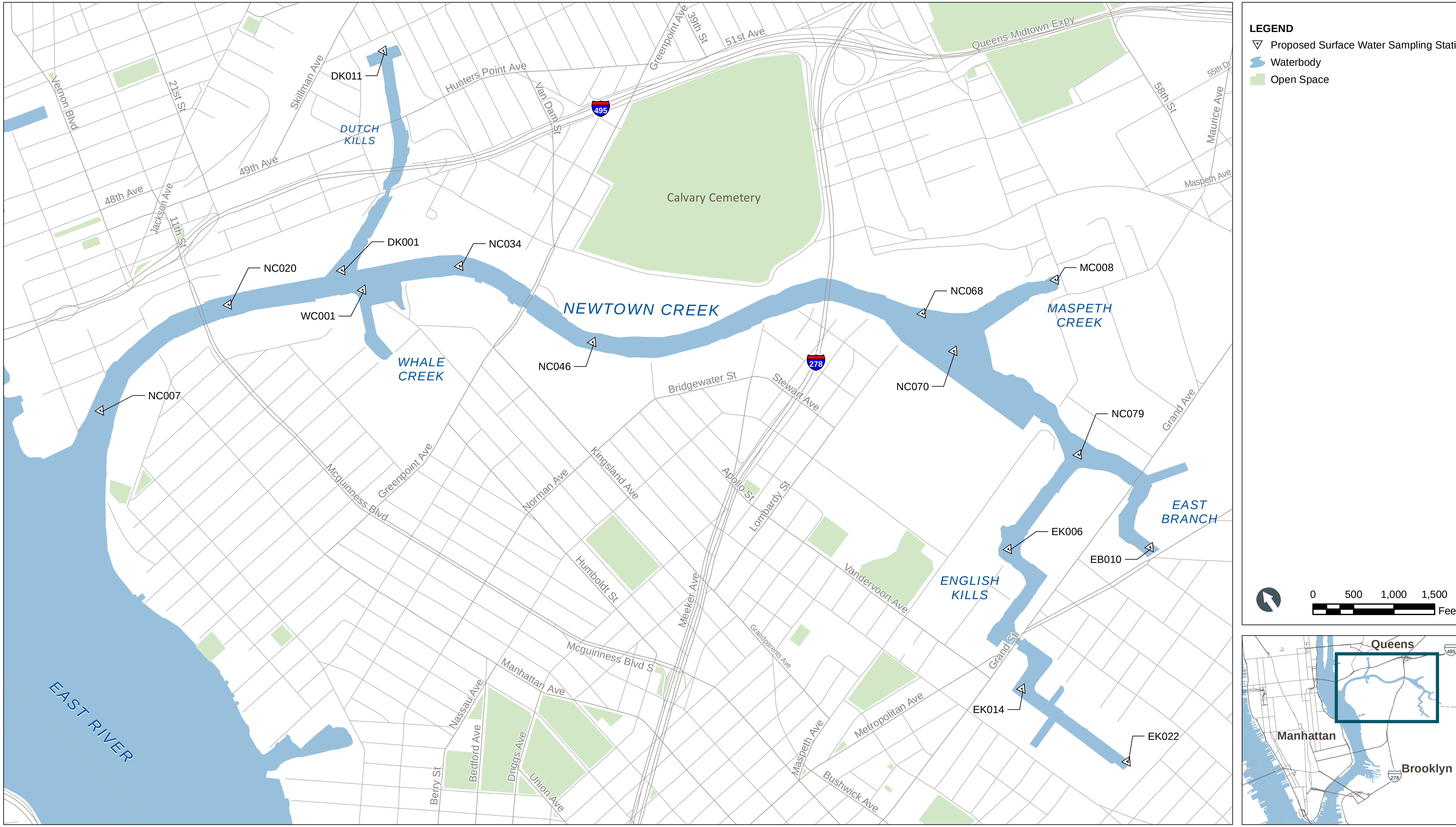
- Ruler and tape measures
- Sample labels
- Sealing tape
- Shipping tape
- Silicone flexible tubing and compatible polymer tubing (typical configuration requires 3/8 inch ID)
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Stainless steel bowls or pans (labeled as needed)
- Storage racks
- Study Area maps
- Sufficient battery and memory capacity for the deployment period
- Survey vessel
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Transport cup
- Vacuum pump
- Water pump (diaphragm pump ca. 10 L/min or better; Shurflo™ or equivalent)
- Weight bearing line/cable and anchor weight
- Weighted line
- Zipper-lock bags

Table 10-3

Surface Water Monitoring Materials and Equipment

See the following SOPs for further details:

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-03 Conductivity, Temperature, Depth (CTD)/Turbidity Data Collection and Water Sampling
- NC-04 Navigation/Boat Positioning
- NC-11 Water Column Profiling and Sample Collection
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal
- NC-17 Multi-Parameter Water Quality Data Collection



Note:
Proposed sampling locations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 10-1
Proposed Surface Water Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

ANCHOR QEA

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 10-1 Proposed Surface Water Sampling Stations.mxd lhudson 10/14/2011 3:32:19 PM

11 CURRENT METER DEPLOYMENTS

This section describes the procedures that will be followed to deploy and maintain current meters.

11.1 Overview

Purpose. The objective of the current meter deployments is to document typical current speeds of surface water in the Study Area and storm events, tidal cycles, and runoff events (if any).

Existing Data Review. Current meters were deployed during the OU6 RI in the area of the Laurel Hill upland facility.

Data Gap Assessment Relative to CSM. Additional distribution of data for understanding the currents in the Study Area represents a data gap for completing the CSM.

Summary of Work to be Performed to Close Data Gaps. The data gaps will be addressed through deploying current meters. Five current meters will be deployed: 1) at the mouth of Newtown Creek; 2) in Newtown Creek immediately downstream from the junction with Dutch Kills; 3) at the mouth of Maspeth Creek; 4) at the mouth of East Branch; and 5) at the mouth of English Kills to help assess hydrodynamics in each of these areas.

At each current meter station, an acoustic velocimeter will be moored on the bottom to maximize the amount of water column available for measurement. Water stage, conductivity, and turbidity will also be measured at each mooring. Each current meter deployment will last for at least 3 months and up to 1 year. Each meter will be checked monthly during deployment to ensure that it is operating correctly and has not become fouled. The current meters will be set up to record the instantaneous current speeds as frequently as possible (e.g., at 5 to 10 minute intervals between measurements). After each check of the meters, the current data will be reviewed to evaluate the range of hydrodynamic conditions represented in the data set. For instance, if the deployment period included higher flow events in the creek and or East River, than the data set may be adequate for model calibration and the meter would be removed prior to the end of the measurement period. If flow conditions over the period of record have been relatively constant, than the meter will be redeployed for an additional 3 months to ensure adequate variability in the data set. If the deployment is terminated after less than 1 year, consideration will be given to seasonal 1-month deployments.

The following activities are included in the current meter deployment:

- **Existing Data Review** – Review of existing Study Area current and suspended solids data (OU6 RI, NYCDEP City-wide Long Term CSO Control Planning Project) and compilation of shipping, construction, and outfall/drainage information that has the potential to affect suspended solids within the Study Area.
- **Current Meter Deploymen**t – Deploy and maintain current meters along the length of the Study Area and monitor current speeds for a minimum of 3 months and a maximum of 1 year.

Table 11-1 provides the current meter stations and rationale for each station. Figure 11-1 shows the current meter stations. These stations may be adjusted based on logistical and security considerations. A log of the rationale for moving any station will be maintained and included in monthly status reports to USEPA. If a station needs to be moved more than 200 feet parallel to the shoreline and/or 50 feet perpendicular to the shoreline, USEPA will be notified prior to deployment.

11.2 Procedures

Current meters placement and monitoring activities are described in the following sections. All of the tasks described in this section will be documented, and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c). Moorings will be deployed for a minimum of 3 months at the five stations shown in Figure 11-1. Based on a preliminary review of the data collected during this initial 3-month period, a summary memorandum will be prepared with recommendations for potential extension of the deployment period and relocation, addition, or deletion of specific moorings.

Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for sample form), and on data collection forms (see SOPs NC-11 – Water Column Profiling and

Sampling and NC-12 – Current Meter Deployment and Data Collection for sample forms) during the monitoring period.

11.2.1 Existing Data Review

Available existing Study Area current and suspended solids data will be researched and considered for use with evaluating the RI Field Program data. This data may be available in the OU6 RI and the NYCDEP City-wide Long Term CSO Control Planning Project reports. Additionally, existing Study Area information will be compiled of shipping, construction, and outfall/drainage information that have the potential to affect suspended solids within the Study Area. This information will be considered for use with the current meter data in the RI evaluation. All data collected will be added to the project files in accordance with the DMP (Anchor QEA 2011c).

11.2.2 Current Meter Deployments

To meet the current meter deployment objectives, four types of meters/instrument packages will be used for this investigation:

- **Acoustic Doppler Current Profiler (ADCP).** This meter provides multiple binned measurements of water velocity and acoustic backscatter over the water column. For mooring deployments, it will be mounted facing upward within a frame anchored to the bottom (with no surface connection). For boat-based surveys, it will be mounted facing downward on the survey vessel (with surface connection and real-time readout and recording).
- **Optical Backscatter Detectors (OBS) Nephelometer**. This meter provides point measurements of optical turbidity. It will be used in recording mode for the mooring deployments (with no surface connection and sensors mounted at separate depths as needed) or in profile mode for use during the boat-based support surveys (with surface connection and real-time data readout). Meters will be outfitted with a wiper that periodically removes fouling from the sensor face.
- **Conductivity, Temperature, Depth (CTD; integrated with the nephelometer).** This meter provides point measurements of salinity (calculated from conductivity), temperature, and relative water depth over the meter (calculated from pressure). It will be used in recording mode for the mooring deployments (with no surface

connection and sensors mounted at separate depths as needed) or in profile mode for use during the support surveys (with surface connection and real-time data readout and recording).

- **Water level gage.** This meter measures water pressure to provide measurements of tidally varying water levels. The meter will be used in recording mode during the mooring deployments. The meter will be fixed-mounted to obtain accurate water level measurements (not subject to any movement that the mooring could experience) and its elevation will be surveyed to allow for conversion of water depth over sensor to an elevation.

The following activities will be conducted as part of the current meter deployments:

- Pre-placement activities will be performed to prepare for deployment of the current meters including a reconnaissance survey to finalize the stations for deployed instruments based on logistical and security considerations.
- Field measurements of select parameters to support and enhance the current meter measurements will be performed prior to deployment and during the monthly checks of current meters.
- Deployment of instrument moorings including an ADCP and standard water quality instrumentation.
- Deployment of two fixed mount recording water level meters to allow conversion of mooring depth measurements to water elevations (see Section 3.6).
- Periodic boat-based surveys to allow moored instrument servicing/data downloading. These surveys will be performed approximately monthly during the deployment period. As part of these surveys, boat-based ADCP measurements will be performed to build velocity profiles along transects across the Study Area at the mooring stations. Boat-based depth profiling of water quality parameters will also be performed during the surveys with collection of samples for laboratory measurement of suspended solids.
- Local precipitation events and CSO/SSO and other discharge data will also be tracked during the mooring deployment period (see Section 11.2.2.7).

During current meter deployments and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.4). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

In addition, during current meter deployments, and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include: kayaking or other non commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges, moored boats, and boat traffic. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

11.2.2.1 Pre-Placement Activities

The following activities will be conducted prior to placement of the current meters:

- Ensuring that required permits and notifications for the type of sampling and locations within the Study Area have been submitted and approved for the days' activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the current meter-related activities.
- Review of existing data information sources for current and suspended solids data sets to assess the range of previously measured data and frequency of variations/excursions to ensure that instrumentation setup for this investigation builds on previous data sets.
- Evaluation of local stations that record precipitation and selection of the most representative station(s) for data tracking and downloading during the mooring

deployment period.

- Development of procedures, through coordination with NYCDEP, for obtaining relevant outfall discharge data during the mooring deployment period.
- Development of procedures for tracking the movement of larger vessels and construction activities within the Study Area through coordination with the Port Authority and the USCG.
- Preparation of a daily float plan listing a plan for communication between the land-side and boat-based field team staff, the area to be assessed or the current meter stations to be serviced, as applicable.
- Completion of a reconnaissance survey with the overall goal of providing information for finalization of mooring stations to ensure representativeness of each station from a measurement standpoint (e.g., outside the influence of interfering structures or localized turbidity sources and sufficient water depth) and to help minimize the risk of instrument damage or loss. The reconnaissance survey will include both boat- and shore-based assessments and will also include coordination with the USCG/Homeland Security and municipalities relative to notification of deployments and survey activities.

11.2.2.2 Reconnaissance Survey

A reconnaissance survey will be performed prior to deployment to review the proposed locations for the current meters and to evaluate their suitability (e.g., location related to field structures, barge traffic, outfall pipes, and utilities) and security relative to disturbance by other activities along the Study Area. A log of the rationale for moving any station will be maintained and included in monthly status reports to USEPA. If a station needs to be moved more than 200 feet parallel to the shoreline and/or 50 feet perpendicular to the shoreline, USEPA will be notified prior to deployment.

It is anticipated that the boat crew for this reconnaissance survey will consist of two field team staff, including a boat captain and a one crew member. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of this survey, the designated field team staff will check in with the Field Team Leader to confirm the schedule and proposed current meter stations and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. A mid-day health and safety meeting will be conducted by the field team staff aboard the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities will be implemented for the reconnaissance survey:

- Load all pre-cleaned profiling equipment on the boat, including decontamination fluids/equipment and IDW containers.
- Navigate the boat to the target station. The boat will be positioned at the target station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI). Data will be collected on a Panasonic Toughbook® handheld tablet computer, or similar equipment, with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy. A custom GPS program will be used to allow for real-time data collection.
- Measure the depth to the mudline with a weighted line.
- Make observations of the suitability of the location for deployment of a current meter (e.g., presence of structures, outfalls pipes, and on- or nearshore activities that may impact the security of the current meter).
- If the station does not appear to be suitable for current meter deployment, identify a nearby station for deployment and repeat the activities identified above (i.e., survey coordinates, measure depth to mudline, and make observations on suitability of station for current meter deployment).
- All field activities will be documented on the Daily Activity Log. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager at the end of each day's sampling activities. Electronic data collection records will be downloaded at the end

of each day and saved to the project files. At the end of the day, any equipment that came in contact with Study Area media will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next day.

11.2.2.3 Measurement Activities

The boat-based measurements described below will be performed at the time of mooring deployment, at mooring retrieval, and during each servicing event. During each event, two sets of measurements will be taken: one near the midpoint of the flood tide and one near the midpoint of the ebb tide.

It is anticipated that the boat crew for measurement activities will consist of two field team staff, including a boat captain and one crew member. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of the measurement activities, the designated field team staff will check with the Field Team Leader to confirm the schedule and the designated current meter stations and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. A mid-day health and safety meeting will be conducted by the field team staff aboard the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities will be implemented for the measurement activities:

- Load all pre-cleaned equipment and sample containers on the boat, including decontamination fluids/equipment and IDW containers, and place fresh ice in the sample holding containers. Sample containers will be available for opportunistic sample collection (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).
- Navigate the boat to the target station. The boat will be positioned at the target station using procedures described in NC-04 – Navigation and Boat Positioning.

- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each station. Data will be collected on a Panasonic Toughbook® handheld tablet computer, or similar, with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy. A custom GPS program will be used to allow for real-time data collection.
- Bank to bank (as depth allows) transects across the waterbody will be performed at each mooring station with a boat-mounted ADCP to characterize the cross-sectional flow patterns.
- A water column profile will be obtained using a boat-based CTD/OBS at the deployed meter station extending from near surface to within 1 foot of the bottom. If significant variations in flow or backscatter are noted during performance of the ADCP transect, an additional vertical profile will be performed using the CTD/OBS to characterize the variation.
- A water salinity profile will be obtained using a multi-parameter sonde.
- Water samples will be collected for analysis of total suspended solids (TSS) at three depths over each water column profile that is performed—within 3 feet of the surface, at mid depth, and within 3 feet of the bottom.
  - Surface water samples will be collected using a combination of peristaltic pump with the sample tubing (and multi-parameter sonde) and Kemmerer bottle attached to a weighted line. Water samples will be collected from the bottom up to the surface as the line is retrieved. Care will be taken to ensure that surface sediments are not disturbed during sample collection by the sampling procedure, propeller wash, or any other event that may create non-representative measurements.
  - Water samples will be transferred directly from the sample tubing into laboratory-supplied containers using USEPA's "clean hands" procedures to minimize contamination. Surface water sampling procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. Following collection, the surface water samples will be placed in a cooler at 4°C for transport to the field facility where they will be packaged for shipment.
- All field activities will be documented, including sampling and profiling procedures, and the Water Quality Data Log will be filled out in its entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.

- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager at the end of each day's sampling activities. At the end of the day, the multi-parameter sonde will be decontaminated per SOP NC-02 – Equipment Decontamination prior to use the next day.

11.2.2.4 Deployment of Instrument Moorings

The current meters will be deployed following the completion of reconnaissance survey and agreement on any required location changes. Prior to deploying a meter at a designated station, the field measurements will be obtained as described in Section 11.2.2.3. Current meters will be provided and deployed by a subcontractor. Current meters will be set up, and tested prior to deployment in accordance with SOP NC-12 – Current Meter Deployment and Data Collection and the manufacturer's recommendations.

It is anticipated that the boat crew for current meter deployment will consist of one field team staff, a boat captain, and a one crew member. The boat crew will be in constant communication with the Field Team Leader during sampling activities.

On each day of the current meter deployment, the designated field team staff will check with the Field Team Leader to confirm the schedule and current meter stations and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities will be implemented for the current meter deployment:

- Check water level pressure transducers for proper operation and download previous month's data in accordance with manufacturer's recommendations.
- Load all pre-cleaned sampling, water quality monitoring, and current meter equipment on the boat, including decontamination fluids/equipment and IDW

containers, and place fresh ice in the sample holding containers. Sample containers for opportunistic sample collection will also be loaded (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).

- Navigate the boat to the target station. The boat will be positioned at the target station using procedures described in NC-04 – Navigation and Boat Positioning.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each current meter station. Data will be collected on a Panasonic Toughbook® handheld tablet computer, or similar, with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy. A custom GPS program will be used to allow for real-time data collection.
- Perform boat-based measurement activities as described in Section 11.2.2.3.
- Initiate data recording and deploy current meter in accordance with manufacturer's recommendations.
- Calibration checks of field instruments will be conducted as needed where readings are suspect to produce accurate and reproducible data.
- Field instruments will be recalibrated at the end of the field day to confirm that the instrument functioned properly throughout the day and to provide information to assess drift, if any, occurring the period of operation.
- All field activities will be documented. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager at the end of each day's sampling activities.
- At the end of the day, the multi-parameter sonde and sampling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination.

11.2.2.5 Deployment of Two Fixed Mount Recording Water Level Meters

As described in Section 3.6, staff gauges and associated pressure transducers will be established at two points within the Study Area so that during water sampling, water levels may be collected to allow correlation to accurate elevations. These pressure transducers will be utilized to track tidal changes during the current meter deployments. During each monthly visit to the current meters, described in Section 11.2.2.6 below, the pressure transducers will be checked for disturbances and data will be downloaded.

11.2.2.6 Periodic Boat-Based Surveys to Allow Moored Instrument Servicing/Data Downloading

Deployed meters will be serviced approximately monthly, with the timing dependent on field conditions (weather and flow) and the history of sensor fouling/debris interference at a given station. The deployed meter(s) will be retrieved, data will be downloaded, and an initial inspection of the data will be performed. The CTD/OBS data will be compared with the water column profile data to evaluate the reproducibility and status of each deployed CTD/OBS. If there are no obvious data quality issues, the instrument will be cleaned, batteries checked, and redeployed. If there are issues with the mooring setup, the meters, or downloaded data, the meter may either be replaced at that time (if a replacement is available), pulled for repair, or a replacement survey scheduled.

Procedures described in Sections 11.2.2.3 and 11.2.2.4 will be followed during this monthly servicing.

11.2.2.7 Monitoring of Local Precipitation Events and Pipe Discharges

Local precipitation events will be monitored during the period of the current meter deployment. A nearby weather station with publicly available data and the on-site weather station will be used to obtain temperature, precipitation, and wind velocity data.

In addition, information regarding CSO discharges from the Newtown Creek Water Pollution Control to the Study Area will be tracked during the mooring deployment period.

11.2.3 Sample Processing

Surface water samples will be processed on the boat at the time of sampling and transferred to the field facility for packaging and shipping. Samples will be transferred from the sample custodian on the boat to a sample custodian on the shore from the field facility using a Custody Transfer Form per SOP NC-13 – Sample Custody. Once samples are received at the field facility, the samples will be checked and information will be entered onto a COC

Record for transport to the laboratory per SOP NC-13 – Sample Custody. Sample containers will be placed in a cooler at 4°C pending shipment to the laboratory per SOP NC-14 – Sampling Packaging and Shipping. Sample handling and shipping procedures are discussed in Section 14.2.3.

11.2.4 Stations and Frequency

Five current meters will be deployed: 1) at the mouth of Newtown Creek; 2) in Newtown Creek immediately downstream from the junction with Dutch Kills; 3) at the mouth of Maspeth Creek; 4) at the mouth of East Branch; and 5) at the mouth of English Kills. Each current meter deployment will be for at least 3 months and may extend up to 1 year.

11.2.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. Nomenclature is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figure 11-1. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SW = Surface water
  - RB = Rinsate blank
  - TB = Trip blank

- Depth = Surface waters will be designated by three depth indicators:
  - A = Near surface
  - B = Middle
  - C = Near bottom
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

Examples:

- A surface water sample collected in the upper water column of Maspeth Creek at the first station on May 16, 2012 would have the id: MC001SW-A-20120516
- A rinsate blank collected in association with chemistry core sampling collected on June 1, 2012 would have the id: SC-RB-20120601

11.2.6 Sample Handling and Analysis

Surface water samples will be analyzed for TSS. Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

11.2.7 Equipment Decontamination

Current meters and related sampling equipment will be in contact with site media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

11.2.8 Investigation-Derived Waste

IDW will be generated during the performance equipment decontamination. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

11.2.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-03 – Conductivity, Temperature, Depth/Turbidity Data Collection and Water Sampling
- NC-04 – Navigation and Boat Positioning
- NC-12 – Current Meter Deployment and Data Collection
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-17 – Multi-Parameter Water Quality Data Collection

11.2.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 11-2.

11.3 Data Processing, Evaluation, and Management

Electronic data collection records, including sample collection, processing, and sample management, will be downloaded as possible and saved to the electronic project files. Paper records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

Analytical data will be validated in accordance with USEPA Region 2 data validation protocols as described in the QAPP (Anchor QEA 2011b) Worksheets #35 (Sampling and Analysis Validation [Steps IIa and IIb] Process Table), #36 (Sampling and Analysis Validation [Steps IIa and IIb] Summary Table), and #37 (Data Usability Assessment). Analytical data will be maintained the project database and accessible only by designated project personnel as described in the DMP (Anchor QEA 2011c).

The boat-based surveys and water samples will provide data to evaluate the time-series data collected from the moored instruments. The TSS results from the water samples collected during the mooring servicing and boat-based transect surveys will be correlated with the OBS data obtained from the moored instrument and from the water column profiles. The correlation between the TSS measurements and the OBS data will be evaluated for usability. A statistically significant R-square value will be calculated to evaluate usability. The acceptable R-square values will be determined based upon the variance within the measured TSS data. If a usable correlation between TSS and OBS is obtained, the OBS data will be correlated with the moored and boat-based ADCP data. Once the ADCP data is correlated to the OBS data, the TSS/OBS correlations will be applied to develop a correlation between ADCP and TSS.

11.4 Reporting

Information obtained from the current meter deployment and related sampling and processing activities will be included in the Phase 1 RI Data Summary Report, RI Report, and other deliverables, as appropriate.

11.5 Schedule

The intended schedule for the current meter related activities is as follows.

- Reconnaissance survey will be performed within 4 weeks of mobilization to the field facility for the Phase 1 RI Field Program.
- If there are changes in the mooring stations, the final mooring stations and configurations will be submitted in a memorandum to USEPA within 2 weeks of completion of the reconnaissance survey.
- Initial mooring deployment will be performed within 4 weeks following approval of any submitted reconnaissance-based modifications.
- Servicing will be scheduled during the first full week of each month during the monthly surface water sampling events, with dates selected based on favorable tides.

Recommendations for setting the length of the initial deployment (3 month minimum) will be submitted to USEPA in a memorandum within 3 weeks following the second round of monthly servicing/data download. The schedule will also be dependent on weather and field conditions.

Table 11-1
Current Meter Stations and Rationale

Station ID	Target Coordinates NAD 83[1] (feet) Easting	Northing	Location in Study Area[1]	Rationale
EB011	1005355.2	200822.2581	East Branch, Near Confluence with Newtown Creek	- Spatially along Study Area - Near confluence of East Branch with Newtown Creek - Collocated with Sedflume core
EK023	1004981.765	200915.0752	English Kills, Near Confluence with Newtown Creek	- Spatially along Study Area - Near confluence of English Kills with Newtown Creek - Collocated with Sedflume core
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	- Spatially along Study Area - Near mouth of Newtown Creek - Collocated with Sedflume core
NC081	998680.7505	208088.3368	Channel of Newtown Creek, Near Confluence with Dutch Kills and Whale Creek	- Spatially along Study Area - Near confluence of Dutch Kills and Whale Creek with Newtown Creek - Collocated with Sedflume core
NC082	1004833.946	203112.1311	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	- Spatially along Study Area - Near confluence of Maspeth Creek with Newtown Creek - Collocated with Sedflume core

Notes:
1 - Current meter locations are approximate and may be modified based on field conditions, access issues, etc.
NAD = North American Datum

Table 11-2

Current Meter Deployments Materials and Equipment

- ADC or electromagnetic current meter (e.g., InterOcean Systems, Inc. S4™ or equivalent). This is a point current instrument providing water velocity and acoustic backscatter at discrete intervals.
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Boat-based mounting system (Acoustic Doppler Current Profiler [ADCP] only)
- Bound, waterproof field logbooks
- Broadband ADCP (e.g., TRDI™ or equivalent). This meter provides multiple measurements or a profile of water velocity and acoustic backscatter over the water column.
- Buoy, instrument caging, and connector deployment cable/chain
- Cell phone
- CFLEX™ or equivalent polymer tubing (typical configuration requires 3/8 inch ID).
- COC forms (electronic)
- Chemical-free wipes
- Clear plastic sealing tape
- Clipboard
- Conductivity, temperature, depth (CTD) instruments. These instruments are used to measure salinity (calculated from conductivity), temperature, and relative water depth over the meter (calculated from pressure). The CTD will be used in conjunction with the nephelometer (OBS3A or equivalent).

Table 11-2

Current Meter Deployments Materials and Equipment

- Connective (serial) cabling
- CTD or stand alone conductivity sensor
- CTD/turbidity instrument package (OBS3A or equivalent)
- Custody tape or seals
- Deionized (DI) “analyte-free” water
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
- Ice
- If station requirements are limited to turbidity, or pressure, then individual turbidity or pressure sensing systems (e.g., HOBO™ or equivalent) will be needed
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated coolers
- Marine VHF (high frequency) radio
- Navigation charts and current meter locations figure
- Optical backscatter (OBS) nephelometer. This meter provides point measurements of optical turbidity.
- Overnight courier airbills or shipping forms
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Replacement batteries
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Sample labels
- Sealable (Ziploc) plastic bags
- Sealing tape
- Shipping tape

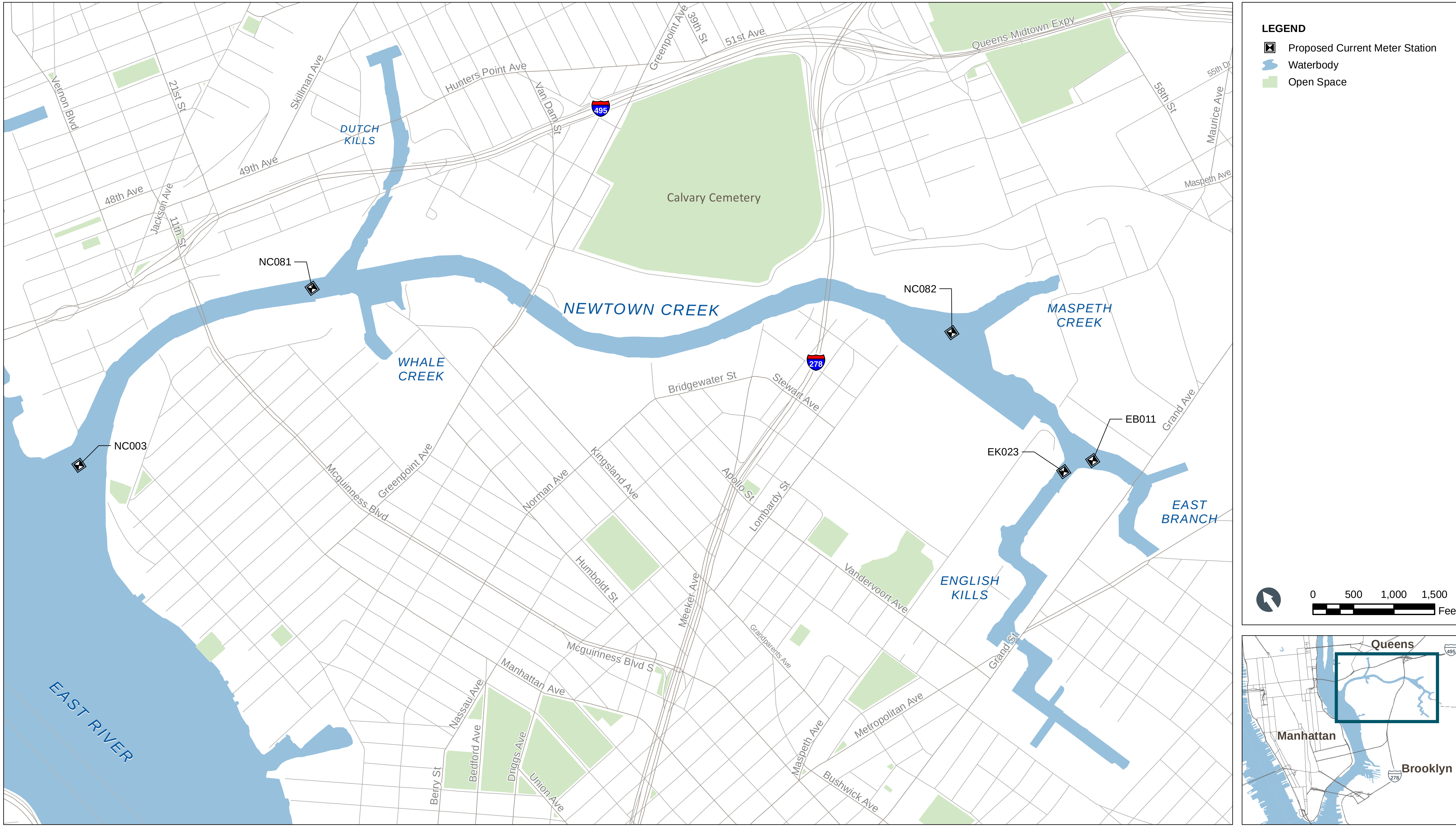
Table 11-2

Current Meter Deployments Materials and Equipment

- Spare parts
- Study Area maps
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Water pump (diaphragm pump ca. 10 L/min or better; Shurflo™ or equivalent)
- Weight bearing line/cable and anchor weight

See the following SOPs for further details:

- NC-01 Field Records
- NC-03 CTD/Turbidity Data Collection and Water Sampling
- NC-04 Navigation/Boat Positioning
- NC-12 Current Meter Deployment and Data Collection
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-19 ADCP/ADC Data Collection



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Note:
Proposed sampling locations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 11-1
Proposed Current Meter Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 11-1 Proposed Current Meter Stations.mxd lhudson 10/14/2011 3:33:19 PM

12 ECOLOGICAL HABITAT SURVEY AND BIOLOGICAL EVALUATION

This section describes the procedures that will be followed to conduct the habitat survey and biological evaluation.

12.1 Overview

Purpose. The purpose of the ecological habitat survey and biological evaluation is to provide the data needed to define remedial approaches and appropriate management activities for risk reduction of impacted sediments and surface water that will be protective of ecological resources.

Existing Data Review. As part of the most recent investigations of sediments in Newtown Creek and its tributaries, a SLERA was conducted for the OU6 RI (Anchor 2007). Previous studies of the Study Area conducted by the NYCDEP have included surveys of phytoplankton, benthic macroinvertebrates, and fish communities within the Study Area (NYCDEP 2007). However, only a summary of these data has been reviewed; the original reports were not available for review. Additional documents reviewed include the *New York City Cross Harbor Freight Movement Project Draft Environmental Impact Statement* (EIS; NYC Economic Development Corporation 2004), the *Greenpoint-Williamsburg Rezoning Final EIS* (NYC Planning Commission 2005), and the *Comprehensive Solid Waste Management Plan Final EIS* (NYC Department of Sanitation 2005), and the USEPA ESI (Weston 2009).

Data Gap Assessment Relative to CSM. Based on the SLERA conducted for the OU6 RI, a BERA will be needed for the Study Area. To refine the CSM and develop the BERA Problem Formulation, the survey of fish and wildlife resources needs to be expanded to the entire Study Area, and a SLERA that incorporates existing sediment and water quality data for the entire Study Area needs to be performed.

Summary of Work to be Performed to Close Data Gaps. Several tasks have been built into Phase 1 RI data collection in order to collect data to support development of a SLERA and a BERA Problem Formulation. These tasks include a habitat survey, benthic community survey, and fish community survey. The BERA Formulation document and associated BERA

Field Sampling Program will address additional data requirements to evaluate risk to ecological receptors in the Study Area. The following sections address data collection during the Phase 1 RI Field Program only.

The ecological habitat survey and biological evaluation will identify ecological resources within the Study Area and ecological resources located at or near the shoreline of the Study Area. The following four activities will be conducted as part of the ecological resource characterization:

- A boat-based shoreline habitat survey of the Study Area will be conducted at or near low tide during the spring or summer to identify ecological habitat and fish and wildlife resources.
- A land-side habitat survey at and near the shoreline of the Study Area will be conducted during the spring or summer to identify ecological habitat and wildlife resources.
- Two benthic community surveys, one in the late summer to reflect low DO levels, and one in the spring to reflect higher DO levels, will be conducted at each of 34 designated stations within the Study Area to assess the integrity of the benthic community.
- Two fish community surveys, one in the late summer and one in the spring, will be conducted within five sampling zones within the Study Area.

Figure 12-1 shows the benthic sampling stations and Figure 12-2 shows the fish survey zones. Table 12-1 provides the benthic sample station names, rationale for each station, and analytes/analyte groups for each station. Table 12-2 provides the fish sampling zone names and the rationale for each zone.

12.2 Procedures

The procedures for the habitat surveys, benthic sampling surveys, and fish surveys are provided in the following sections. All of the tasks described in this section will be documented, and this documentation will be stored in the project files as described in the DMP (Anchor QEA 2011c). During field activities, field conditions will be documented. Field notes will be maintained on the Daily Activity Log (see SOP NC-01 – Field Records for sample form) and on data collection forms (see SOPs NC-11 – Water Column Profiling and Sampling, NC-18 – Fish Community Survey, and NC-22 – Benthic Community Survey Sampling for sample forms) during the sampling periods. Photographs will be taken of the samples and any significant observations made during sampling.

During the habitat survey and biological evaluation and other on-water activities, a visual survey will be performed of the shoreline for intertidal shoreline seeps (fluid emerging from the shoreline), overland flow locations, flow from outfalls and other pipes discharging to the Study Area, estimates of rates of discharge, visual signs of impacts (sheens, color, and solids), and the presence of floatables. The objective of this survey is to identify significant contributors of water discharges to the Study Area that may be sampled as opportunistic water samples during the Phase 1 RI Field Program (see Section 10.2.5). Locations for the collection of these samples will be identified based on the results of these visual surveys and will be documented in a Field Modification Form submitted to USEPA. More extensive sampling of water discharges to the Study Area is planned for the Phase 2 RI Field Program.

Also during the habitat survey and biological evaluation, and other on-water activities, recreational, industrial, and ecological use of the Study Area will be documented in photographs and in the field log book. The types of potential recreational activities that the field team staff will look for will include kayaking or other non commercial water craft on the water, scuba divers, fishing from on the water or from the shore, and crabbing along the shore. The types of industrial use on the Study Area include loading and unloading of barges. As part of the ecological evaluation, the field team staff will make observations of flora and fauna.

12.2.1 Boat-Based Shoreline Habitat Survey

The boat-based shoreline habitat survey will be conducted after the physical shoreline assessment described in Section 5.2.3 has been completed and the resulting data have been compiled. The survey will cover the entire length of the Study Area. To ensure that intertidal areas are visible, the shoreline habitat survey will be conducted during the spring or summer at or near low tide, preferably during a spring tide when the lowest tide conditions will occur. A schedule for the shoreline habitat survey will be developed based on occurrence of low tide. It is anticipated that the boat-based survey will be conducted over a period of up to 2 weeks in order to complete the survey at or near low tide.

12.2.1.1 Pre-Survey Activities

Pre-survey activities will be completed prior to initiating the shoreline habitat survey. These activities are summarized below:

- Reviewing the results of the aerial photography and hydrographic surveys to focus the efforts of the survey and to ground-truth the aerial photography (aerial photography will be put into a map book for use as a base map during the survey)
- Review of relevant guidance documents for classifying vegetation types
- Ensuring that required permits and notifications for the work within the Study Area have been submitted and approved for the day's activities (see Table 3-1)
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the survey activities
- Checking tide charts for water level conditions for the survey period and developing a schedule to ensure survey occurs at or near low tide
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions
- Preparing a daily float plan that lists the areas to be assessed
- Checking that both water level pressure transducers are working properly
- Obtaining aerial photographs for survey area prior to survey

12.2.1.2 Survey Activities

It is anticipated that the boat crew for shoreline habitat survey will consist of two field team staff, including a boat captain and one crew member. The boat crew will be in constant communication with the Field Team Leader during sampling activities. The boat and crew will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the shoreline habitat survey, the designated field team staff will check with the Field Team Leader to confirm the schedule and area to be surveyed and collect the appropriate communications equipment. Sample containers for opportunistic sample collection will also be loaded onto the boat (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7). In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

Survey observations will be collected with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy. Descriptive attributes of shoreline habitat features will be documented including:

- Identification of potential habitat
- Description of cover types, including typical vegetative species and rare or protected plants
- Identification of wetland habitat types and stream classifications
- Identification of typical fish and wildlife species to be expected for each cover/wetland type, endangered, threatened, and rare species, or species of special concern
- Observations of stress (e.g., presence of seeps, dead or dying vegetation)
- Identification and locations of outfalls, seeps, and sheens

The GPS program will include data entry forms to standardize data collection, improve efficiency, and reduce post-processing requirements. The program will be loaded with background layers identified in the data review portion of the shoreline assessment for reference, ground-truthing, and updating. Digital photographs of identified shoreline features will also be taken and recorded in the attribute record on the electronic data form. If a shoreline feature is not approachable by boat due to channel conditions or obstructions, a GPS offset or digitized location will be collected instead. Field team staff will also record observations of boat traffic, sheens, pipe discharges, seeps, locations of overland flow, and accumulation of floatables, noting relative position and time of day. The results of the aerial photography survey will also be field verified where possible.

At the end of each day of the shoreline habitat survey, field team staff will return materials and equipment to the field facility. Field team staff will provide the field records to the Field Team Leader who will review the field data collected as described in NC-01 – Field Records and the DMP (Anchor QEA 2011c). From the field facility, the Field Team Leader will scan and save the field data to the project files, as specified in the DMP (Anchor QEA 2011c).

12.2.1.3 Sample Processing

No samples will be collected as part of this activity.

12.2.1.4 Stations and Frequency

The entire Study Area shoreline will be evaluated during the shoreline habitat survey. The survey will be conducted once during a 1- to 2-week period early in the Phase 1 RI Field Program.

12.2.1.5 Sample Designation

No samples will be collected as part of this activity. Specific attributes of the shoreline will be recorded based on their locations as described above.

12.2.1.6 Sample Handling and Analysis

No samples will be collected as part of this activity.

12.2.1.7 Equipment Decontamination

None of the equipment used for the survey is planned come in contact with site media; therefore, no equipment decontamination will be required. Should equipment become contaminated, it will be decontaminated in accordance with SOP NC-02 – Equipment Decontamination.

12.2.1.8 Investigation-Derived Waste

IDW will not be generated during the performance of the survey and assessment. However, PPE will be generated as IDW and will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

12.2.1.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-04 – Navigation and Boat Positioning
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-23 – Boat-Based Shoreline Habitat Survey

12.2.1.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 12-3.

12.2.2 Land-Side Habitat Survey

The land-side habitat survey will be completed in late spring when fauna around the Study Area should be most active. The survey will cover areas near the Study Area that have been identified as potential habitat areas based on existing maps and aerial images. It is anticipated that the land-side habitat survey will be conducted over a period of 1 to 2 weeks.

12.2.2.1 Pre-Survey Activities

Pre-survey activities will be completed prior to initiating the land-side habitat survey. These activities are summarized below:

- Reviewing the results of the aerial photography and hydrographic surveys to focus the efforts of the survey and to ground-truth the aerial photography (aerial photography will be put into a map book for use as a base map during the survey).
- Review of relevant guidance documents for classifying vegetation types.
- Ensuring that required notifications and access for the work within the Study Area have been submitted and approved for the day's activities (see Table 3-1).
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the survey activities.

- Checking weather conditions for the day prior to leaving the facility and throughout the day for changing conditions.

12.2.2.2 Survey Activities

It is anticipated that the field team staff for the land-side habitat survey will consist of two field team staff. The field crew will be in constant communication with the Field Team Leader during survey activities. The field team staff will meet all health and safety requirements as specified in the HASP (Anchor QEA 2011a).

Using the results of the aerial photography and hydrographic surveys, the land-side survey will ground truth features within one quarter mile that may have an impact on the Study Area. The survey will be through accessible (i.e., public areas) areas and will consist of preparing maps showing general habitats, including: paved and bare ground/sterile; paved with gravel and sparse weeds; gravel; dirt and rubble with weeds; recovering wetlands/marsh; shrub and scrub; bank with riparian vegetation; wetlands spots, etc. Potential wetland areas will be identified per USACE wetland delineation methodologies. Special attention will be made areas that may qualify as a wetland.

On each day of the land-side habitat survey, the designated field team staff will check in with the Field Team Leader to confirm the schedule and area to be surveyed and collect the appropriate communications equipment. Survey observations will be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy. Descriptive attributes of land-side habitat will be documented as follows:

- Upland habitat type
- Vegetation type, including emergent vegetation, invasive species, and stressed vegetation
- Aquatic and riparian habitat type (e.g., intertidal, bulkhead, and riprap)
- Surface cover type
- Outfalls, seeps, and sheens identified during the shoreline survey

The GPS program will include data entry forms to standardize data collection, improve efficiency, and reduce post-processing requirements. The program will be loaded with background layers identified in the data review portion of the shoreline assessment for reference, ground-truthing, and updating. Digital photographs of identified features will also be taken and recorded in the attribute record on the electronic data form. Field team staff will also record observations of boat traffic, sheens, locations of overland flow, and accumulation of floatables, noting relative position and time of day. The results of the aerial photography survey will also be field verified where possible.

At the end of each day of the land-side habitat survey, field team staff will return materials and equipment to the field facility. Field team staff will provide the field records to the Field Team Leader who will review the field data collected as described in NC-01 – Field Records and the DMP (Anchor QEA 2011c). From the field facility, the Field Team Leader will scan and save the field data to the project files, as specified in the DMP (Anchor QEA 2011c).

12.2.2.3 Sample Processing

No samples will be collected as part of this activity.

12.2.2.4 Stations and Frequency

The entire Study Area land-side shoreline area will be evaluated during the land-side habitat survey. The survey will be conducted once during a 1- to 2- week period early in the Phase 1 RI Field Program.

12.2.2.5 Sample Designation

No samples will be collected as part of this activity. Specific attributes of the shoreline will be recorded based on their location as described above.

12.2.2.6 Sample Handling and Analysis

No samples will be collected as part of this activity.

12.2.2.7 Equipment Decontamination

None of the equipment used for the land-side habitat survey will come in contact with Study Area media, therefore, no equipment decontamination will be required.

12.2.2.8 Investigation-Derived Waste

IDW will not be generated during the performance of the land-side habitat survey. However, PPE will be generated as IDW and will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

12.2.2.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-24 – Land-Side Habitat Survey

12.2.2.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 12-4.

12.2.3 Benthic Community Survey

The benthic community survey will be conducted within the same time frame as the surface grab sampling and fish community survey, when possible. In order to provide a representative assessment of the benthic community, two rounds of surface sediment and benthic sampling will be conducted, one in the late summer to reflect low DO levels and one in the spring to reflect higher DO levels. Samples will be collected using surface sediment sampling equipment at the selected stations and submitted to a laboratory for identification and enumeration of benthic invertebrates present in the sample.

During the period of high DO, sediment samples will be collected concurrently with the benthic samples for chemical analysis as described in Section 7. During the period of low DO, sediment samples will be collected concurrently with the benthic samples for parameters that are key determinants of benthic community structure (i.e., grain size, TOC, ammonia, and sulfides). In addition, the low DO samples will be evaluated for iron and manganese, which are highly dependent on redox conditions in the sediment. During the low DO event, sediment samples collected for potential future chemical analyses will be archived by freezing. These samples will be analyzed if benthic community metrics (abundance, species richness, and species diversity) show notable differences between the two macroinvertebrate community surveys that cannot be accounted for by seasonal effects.

At each benthic sampling station, a surface water profile will be completed, and a surface water sample will be collected as described in Section 10.

12.2.3.1 Pre-Sampling Activities

Pre-sampling activities will be completed prior to initiating the benthic community survey sampling event. These activities are summarized below:

- Ensuring that required permits and notifications for the type of sampling and sampling stations within the Study Area have been submitted and approved for the day's activities (see Table 3-1). This includes a NYSDEC License to Collect and Possess.
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the survey activities.
- Obtaining utility locations for the sampling period and area within the Study Area, ensuring that all utility crossings have been identified (see Section 3), and relocating any station that is within 30 feet vertically or 100 feet horizontally from any utilities or related infrastructure.
- Identifying the type of boat for sampling based on logistical constraints due to bridges and tides. Appendix B provides pertinent information, including contact telephone numbers for each of the moveable bridges. A medium-sized boat is proposed for surface sediment sampling activities, but a small-sized boat may be necessary for some portions of the Study Area. These areas include Dutch Kills where access may be limited by fixed bridge clearance and tributary headwaters where floatables containment booms may limit access and areas of sediment accumulation will limit access.
- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the day prior to leaving the dock and throughout

the day for changing conditions.

- Calibrating the multi-gas meter and H_2S meter for use on board the boat.
- Obtaining the final sample table from Project Chemist that will be compiled for each sampling mobilization and organized by station. This table will include station number, analyses to be conducted, QA/QC samples required, holding times, preservation, and the laboratory address. USEPA will be notified 2 weeks (minimum) in advance of sampling and provided a copy of the final sample table.
- Preparing a daily float plan that lists the stations to be sampled, target station coordinates, and sample analysis requirements. Target coordinates will be pre-loaded into a DGPS unit.
- Checking that water level pressure transducers are working properly.

12.2.3.2 Sampling Activities

It is anticipated that the boat crew for the benthic community survey sampling activities will consist of four field team staff, including a boat captain and three crew members. The boat crew will be in constant communication with the Field Team Leader during sampling activities. The boat and crew will meet health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the benthic community survey sampling, the designated field team staff will check with the Field Team Leader to confirm the schedule and stations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and sampling procedures will be implemented for the benthic sampling events:

- Load all pre-cleaned sampling equipment and required sample containers on the boat, including decontamination fluids/equipment and IDW containers, and place fresh ice in sample holding containers. Should the sampling boat be of insufficient size to accommodate the required sample containers, a support boat will be used to transport containers and collected samples (under COC) as necessary. Sample containers for opportunistic sample collection will also be loaded (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).

- Navigate the boat to the target sampling station. The boat will be positioned and secured at the target sample station using procedures described in NC-04 – Navigation and Boat Positioning.
- At each station, four activities will be conducted: surface water profiling, surface water sample collection, surface sediment sample collection for chemical/physical analysis, and benthic invertebrate collection.
- Survey coordinates (horizontal datum in NAD83 using NYLI) will be recorded for profiling and for each sample attempt on the applicable field form (e.g., for surface water, Water Quality Data Log and Surface Water Sample Collection Record included in SOP NC-11 – Water Column Profiling and Sampling; for sediments collected for chemical/physical analysis, Sediment Grab Collection Record included in SOP NC-05 – Sediment Grab Sampling; and for sediments collected for benthic analysis, Benthic Infaunal Grab Sample Collection Record included in SOP NC-22 – Benthic Community Survey Sampling). Data will be collected with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy, or equivalent. Once the station is reached, a surface water profile will be conducted as follows:
  - Water column profile data will be measured with a multi-parameter sonde capable of logging DO, temperature, salinity, conductivity, pH, turbidity, and depth. Prior to obtaining profile water quality data, the depth to the mudline will be measured with a weighted water level meter, tape, or other depth measurement device. A secondary approximate measurement of depth to the mudline using the sampling vessel's sonar will also be conducted. Water quality measurements will be recorded at the water surface (approximately 6-inch [15-cm] depth) and at 1-foot (30-cm) intervals until approximately 1 foot (30 cm) above the mudline. Water quality measurement procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. Data will be collected with an external Trimble® GeoXH GPS receiver capable of sub-foot accuracy, or

equivalent. In addition to the manual water quality measurements, the multi-parameter sonde will be operated in the logging mode for a continuous record of the water quality measurements. This continuous record will be downloaded at as possible.

- A surface water sample will be collected 1 foot above the mudline as follows:
  - Surface water samples for analyses other than VOCs will be collected using a peristaltic pump with the sample tubing (and multi-parameter sonde) attached to a weighted line. A trigger-activated Teflon-coated or stainless steel bottle sampler, or equivalent, will be used to collect samples for VOC analysis. The water sample will be collected as the line is retrieved.
  - Water samples will be transferred directly from the sample tubing into laboratory-supplied containers (refer to sample table provided by Project Chemist) using USEPA's "clean hands" procedures to minimize contamination. Surface water sampling procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. Following collecting the surface water samples will be placed in a cooler at 4°C for transport to the field facility where they will be packaged for shipment.
- Sediment samples for the benthic community survey will be collected using an Eckman or similar sampler, if required, to a depth of 0.5 feet. Since the macroinvertebrate sampling requires specific volume replication as a basis for calculation of sample metrics and community assessments, the same sampling device, or sampling devices with the same measurements and volume, will be used for the benthic invertebrate sample collection. Refer to sample table provided by the Project Chemist for a list of analyses and QA/QC samples required for each station.
  - Three discrete replicate samples for the benthic community survey will be collected at each station, each from separate grab samples. Samples for the benthic community survey will not be composited.
  - Separate grab samples will also be collected for chemical analysis.
    - The sediment sample collected during the high DO period of the year will be collected for chemical analysis as described in Section 7.
    - The sediment sample collected during the low DO period of the year will be

analyzed for grain size, TOC, ammonia, sulfides, iron, and manganese. In addition, a sediment sample will be collected and archived.

- The sediment samples will be taken as follows:
    - The sampler will be lowered with the winch to the sediment surface/mudline and allowed to penetrate into the sediments. The messenger will then be released to trigger the collection of the surface sediment sample. Following release of the messenger, the boat's position will be recorded.
    - The sampler will then be raised slowly to prohibit washing of the sediment from the sampler.
    - Once the surface sediment grab sample is retrieved, evaluate whether the sample is acceptable to be retained for processing (i.e., sediment penetration depth is adequate and there are no signs of washout or channeling of the sediment surface) per SOP NC-05 – Sediment Grab Sampling. If acceptable, the surface sediment grab sample will be retained for sample collection. At some stations, several attempts may be required to obtain acceptable surface sediment grab samples and more than one grab sample may be required at each station.

- The sampling equipment will not be decontaminated between discrete samples, but the samples will be collected as discrete samples.
- The surface sediment samples collected for chemical analysis and for the benthic community survey will be processed on the boat. Benthic community samples will be processed following the procedures described below in Section 12.2.3.3, Sample Processing.
- Material in unacceptable grabs, decontamination fluids, and spent PPE will be containerized separately as IDW, transferred to the field facility, and disposed of according to SOP NC-15 –Investigation-Derived Waste (IDW) Handling and Disposal.
- All field activities will be documented including surface sample collection procedures and custody transfer of the samples. The Grab Sample Collection Record (SOP NC-05 – Sediment Grab Sampling) will be filled out in its entirety. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records. Field records and forms will be reviewed by the Field Team Leader, scanned, and sent to

the Data Management Task Manager as possible.

- At the end of the day and between stations, all sampling equipment will be decontaminated per SOP NC-02 – Equipment Decontamination.

12.2.3.3 Sample Processing

All samples (benthic macroinvertebrates, surface sediment, and surface water) collected as part of the coordinated sampling events of the benthic community survey will be processed on the respective boats as follows:

- Surface water samples will be placed directly into the laboratory-provided sample containers.
- Surface sediment sample processing procedures for chemical and physical characterization are presented in Section 7.2.
- Surface sediment samples for the benthic community survey will be processed as three discrete samples. These samples will not be composited. The processing procedures for these samples are as follows and are provided in more detail in SOP NC-22 – Benthic Community Survey:
  - Gently wash the sediment with filtered site water through a 500-micron sieve. Contain the water as IDW. Very low pressure will be used to rinse sediment through the sieve to make sure that animals within the sample are not destroyed during the sediment sieving process.
  - The portion of the sample remaining on the screen after sieving will be retained for analysis. Carefully wash the sample through a funnel into the laboratory-provided sample container. Rinse the funnel and cap the jar to prevent loss from spilling. Continue this process until the entire sample has been washed and placed in the sample container.
  - Once the entire sample has been sieved and collected in the sample jar, preserve with 10% buffered formaldehyde solution. Seal the jar tightly and wrap the top of the bottle with parafilm or electrical tape to prevent leakage and the escape of fumes during transport. Each jar will have one teaspoon of borax added to buffer the formaldehyde solution and prevent animals with calcareous shells and spicules from dissolving.
- Samples will be transferred from the sample custodian on the boat to a sample

custodian on the shore from the field facility per SOP NC-13 – Sample Custody. Once samples are received at the field facility, the samples will be checked and information will be entered onto a COC Record for transport to the laboratory per SOP NC-13 – Sample Custody. Sample containers will be placed in a cooler at 4°C pending shipment to the laboratory per SOP NC-14 – Sampling Packaging and Shipping. After 24 hours and PRIOR to shipping, the preserved samples will be transferred to 75% ethyl alcohol solution for preservation for shipping. Sample handling and shipping procedures are discussed in Section 14.2.3.

- All field activities will be documented, including sample processing procedures, sample collection and COC, and shipment to the laboratories. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records. Field records and forms will be downloaded to a field facility computer at the end of each day's processing activities, and this information will be forwarded to the Data Management Task Manager.

12.2.3.4 Sample Location and Frequency

Sample stations are shown in Figure 12-1. The Phase 1 RI Field Program includes two sampling rounds for the benthic community surveys.

12.2.3.5 Sample Designation

Samples will be uniquely identified at the time of collection as described in Section 14.2.1. The nomenclature that will be used is {station identification}{matrix code}-{depth}-{date} where:

- Station identification = 5-character identifier for the station identified in Figures 7-1 to 7-4. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek

  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills

- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SG = Sediment grab
  - SW = Surface water
  - RB = Rinsate blank
  - TB = Trip blank
- Depth: Sediment samples = 6-character identifier indicating the depth in centimeters from where the samples were collected.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A surface grab sample collected at the 26th station of the main Newtown Creek area with a depth of 0 to 15 cm collected on September 8, 2011 would have the id: NC026SG-000-015-20110908
- The duplicate of this sample would have the id: NC1026SG-000-015-20110908
- A surface grab collected at the fifth station of the Dutch Kills area with a depth of 0 to 15 cm collected April 27, 2012 would have the id: DK005SG-000-015-20120427
- A rinsate blank collected in association with sediment grab sampling collected on June 1, 2012 would have the id: SG-RB-20120601

12.2.3.6 Sample Handling and Analysis

Surface water samples will be analyzed for nutrients (i.e., total and dissolved nitrogen and phosphorus), ammonia, TSS, total dissolved solids (TDS), TOC, and dissolved organic carbon (DOC). Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Table 12-5 provides the list of analyses, containers, sample size, and laboratory information. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

During the high DO sampling event, surface sediment samples will be analyzed for a broad list of constituents identified in the RI/FS Work Plan Table 4-4 (AECOM 2011) and summarized by analysis in Table 7-2 in this FSAP and in QAPP (Anchor QEA 2011b) Worksheet #20 (Field Quality Control Sample Summary Table). Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Further information on the analytical program and specific analytes are provided in the QAPP (Anchor QEA 2011b).

For the low DO sampling event, surface sediment samples will be analyzed for grain size, TOC, ammonia, sulfides, iron, and manganese as presented in Table 7-2. Samples will be packaged and shipped to the laboratory in accordance with NC-14 – Sample Packaging and Shipping, see Section 14.2.3. Table 12-5 provides the list of analytes, containers, sample size, and laboratory information. Further information on the analytical program and specific analyses are provided in the QAPP (Anchor QEA 2011b)

Surface sediment samples analyzed for the benthic community survey data will be evaluated for species composition and richness, abundance, and appropriate diversity and faunal similarity indices as presented in Table 12-5. The extent of the pollution tolerant species will also be quantified. More detail will be provided on the methods for benthic invertebrate sorting and identification once a benthic invertebrate laboratory has been contracted.

12.2.3.7 Equipment Decontamination

Sediment and surface water sampling equipment will be in contact with Study Area media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in SOP NC-02 – Equipment Decontamination.

12.2.3.8 Investigation-Derived Waste

IDW will be generated during the performance of the surface water and sediment sampling and equipment. PPE will also be generated as IDW. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in Section 15 of this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

12.2.3.9 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-02 – Equipment Decontamination
- NC-04 – Navigation and Boat Positioning
- NC-05 – Sediment Grab Sampling
- NC-11 – Water Column Profiling and Sampling
- NC-13 – Sample Custody
- NC-14 – Sample Packaging and Shipping
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-16 – Photoionization Detector Calibration and Operation
- NC-17 – Multi-Parameter Water Quality Data Collection
- NC-22 – Benthic Community Survey

12.2.3.10 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 12-4.

12.2.4 Fish Community Survey

The fish community survey will be conducted within the same time frame as the benthic community survey. The fish community will be sampled in the late summer to reflect low DO levels and in the spring to reflect higher DO levels and spring migration. Fish will be sampled in five zones that are located at the reaches shown in Figure 12-2.

Survey locations within each zone will be based on accessibility, known substrate, commercial vessel movement, visual observations at the time of collection (i.e., bird activity), tide and current, water depth, and the ability to safely deploy and retrieve specified gear types within each of the habitats.

12.2.4.1 Pre-Survey Activities

Pre-survey activities will be completed prior to initiating the fish community survey. These activities are summarized below:

- Ensuring that required permits and notifications for the work within the Study Area have been submitted and approved for the day's activities (see Table 3-1). This includes the NYSDEC License to Collect and Possess.
- Review of HASP (Anchor QEA 2011a) for potential hazards, appropriate PPE, and safety meetings to be conducted prior to and during the survey activities.
- Checking tide charts for water level conditions throughout the sampling period.
- Checking weather conditions for the day prior to leaving the dock and throughout the day for changing conditions.
- Preparing a daily float plan that lists the areas to be assessed.
- Checking that water level pressure transducers are working properly.

12.2.4.2 Sampling Activities

It is anticipated that the boat crew for fish survey activities will consist of two field team staff, including a boat captain and one crew member, as necessary. The boat crew will be in constant communication with the Field Team Leader during survey activities. The boat and crew will meet project health and safety requirements as specified in the HASP (Anchor QEA 2011a).

On each day of the fish survey, the designated field team staff will check in with the Field Team Leader to confirm the schedule and stations to be sampled and collect the appropriate communications equipment. In addition to the daily safety meeting conducted by the POSO, a health and safety meeting will be performed by the boat captain prior to boarding the boat. Prior to leaving the dock, the POSO or a designee will confirm that the captain has completed an inspection of the boat, including an inventory of required safety gear (i.e., personal floatation devices and radios), has conducted a communications check, and has filed a float plan.

The following activities and procedures will be implemented each day for the fish community survey:

- Load all pre-cleaned survey equipment and sample containers (in the event a fish sample is required) on the boat, including decontamination fluids/equipment and IDW containers. Sample containers for opportunistic sample collection will also be loaded (with collection and analysis performed in conformance with the field modification requirements as described in Section 1.7).
- Navigate the boat to the target survey area.
- Record survey coordinates (horizontal datum in NAD83 using NYLI) for each survey on the Fish Survey Location Data Form included in SOP NC-18 – Fish Community Survey. Surface water profile locations will be recorded on the Surface Water Sample Record included in SOP NC-11 – Water Column Profiling and Sampling. Data will also be collected with an external Trimble GeoXH GPS receiver capable of sub-foot accuracy. A water column profile will be conducted at the approximate midpoint of a reach prior to performing the fish community survey.
  - Water column profile data will be measured with a multi-parameter sonde capable of logging DO, temperature, salinity, conductivity, pH, turbidity, and depth. Upon arriving at the sample location, the depth to mudline will be measured with a weighted water level meter, tape, or other depth measurement device. A secondary approximate measurement of depth to the mudline using the sampling vessel's sonar will also be conducted. Water quality measurements will be recorded at the water surface (approximately 6-inch [15-cm] depth) and at 1-foot (30-cm) intervals until approximately 1 foot (30 cm) above the mudline. Water quality measurement procedures are detailed in SOP NC-11 – Water Column Profiling and Sampling. In addition to the manual water quality measurements, the multi-parameter sonde will be operated in the logging mode for a continuous record of the water quality measurements. This continuous record will be downloaded as possible.
- Following the water column profile, the fish survey will be performed in accordance

with SOP NC-18 – Fish Community Survey. Preference will be given to the use of methods with low mortality rates. These methods may include otter trawls to sample bottom-oriented species and purse nets, seines, traps, and gill nets to capture open water species. The sampling method will take into consideration potential marine traffic in the Study Area. Since the fish community survey requires consistent sampling effort as a basis for calculation of sample metrics and community assessments, the same sampling device and level of effort (length of time samplers are deployed, trawling speeds, distance sampled), will be used for fish community survey. The specifics of each sampling method are described in SOP NC-18 – Fish Community Survey.

- Fish will be processed in the field. During the fish processing effort, to keep the mortality rates low, once the fish are captured, they will be placed into an aerated live well or into large aerated coolers. Processing will include identifying each individual species, weighing each species in mass, and recording any external abnormalities. Some fish may be taken back to the laboratory for species verification. The resulting data will be compiled and analyzed to: 1) identify the fish and epibenthic invertebrate fauna present in the Study Area; and 2) provide preliminary estimates of catch per unit effort, diversity; abundance, and dominance within each sampling zone. Catch per unit effort will only be compared to similar sampling methods. It should be noted that there may be few or no fish present at times in portions of the Study Area. The absence of fish reasonably attributed to local habitat factors will be noted. Additional information on fish processing is provided below in Section 12.2.4.3.
- All field activities will be documented, including sample processing activities, sample collection and COC, and shipment to the laboratories (if required). Field forms are included in SOP NC-18 – Fish Community Survey. Field documentation procedures are detailed in Section 14 and in SOP NC-01 – Field Records.
- Survey data and field records/forms will be reviewed by the Field Team Leader, scanned, and sent to the Data Management Task Manager as possible. Electronic data collection records will be downloaded as possible and saved to the project files in accordance with the DMP (Anchor QEA 2011c).
- At the end of the day and between stations, all field equipment will be decontaminated per SOP NC-02 – Equipment Decontamination prior to the next use.

12.2.4.3 Sample Processing

During processing, species will be handled as little as possible to promote survival. Once individual processing is complete, live specimens will be released back into the waterbody away from the sample location. Dead specimens will be disposed of as IDW. The following procedures will be followed for fish processing:

- Specimens will be sorted by species and identified to lowest taxonomic level practicable. Any evidence of physical anomalies will be noted on the Fish Specimen Data Form (refer to SOP NC-18 – Fish Community Survey).
- Specimens will be weighed and measured, and measurements will be recorded to the nearest gram or centimeter (respectively), as described in SOP NC-18 – Fish Community Survey.
- The first 20 fish of each species per station will be individually weighed and measured. In addition, the sex of blue crabs will also be determined. In the event that more than 20 individuals of one species are collected during one sample event, the initial 20 individuals will be treated as a subsample and the remaining fish will not be measured but weighed as a batch. If large numbers of individuals are collected, the total weight of the subsample will be used along with the batch weight of the remaining fish to estimate the total number of fish collected.
- Species encountered with questionable identification along with a voucher sample for common species will be photographed and will either be iced for later examination or identification or preserved in 9% buffered formalin, labeled, and placed in an appropriately sized sample jar for further examination in the laboratory.

All data related to each of the fishery collections (date, time, location, gear, number of each species captured, and length and weight of specimens measured) will be recorded directly on standardized forms during processing.

12.2.4.4 Sample Location and Frequency

Survey areas are shown in Figure 12-2. The Phase 1 RI Field Program includes two fish community surveys.

12.2.4.5 Sample Designation

No samples are planned to be collected during the fish community survey. Should a fish be submitted to the laboratory for species identification, it will be designated by the fish sampling zone, date, and the prefix "F" and the number of fish collected for analysis (e.g., FSZ1-061511-F01).

12.2.4.6 Sample Handling and Analysis

Fish survey samples will not be submitted for chemical analysis. Fish submitted to the laboratory for further evaluation for species identification will be preserved in 9% buffered formalin for shipment to the laboratory.

12.2.4.7 Equipment Decontamination

Water profiling and fish survey equipment will be in contact with Study Area media and, therefore, will require decontamination. Decontamination of the equipment will be performed in accordance with the procedures described in Section 15 of this FSAP and SOP NC-02 – Equipment Decontamination.

12.2.4.8 Investigation-Derived Waste

IDW will be generated during the performance of the surface water profiling equipment decontamination and may include fish that do not survive the survey process. PPE will also be generated as IDW. This IDW will be temporarily stored at the field facility and disposed of following the procedures described in this FSAP and SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal.

12.2.5 Standard Operating Procedures

The following SOPs are relevant to this activity:

- NC-01 – Field Records
- NC-04 – Navigation and Boat Positioning
- NC-11 – Water Column Profiling and Sampling
- NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal
- NC-18 – Fish Community Survey

12.2.6 Materials and Equipment

The materials and equipment that may be required to complete these procedures are provided in Table 12-5.

12.3 Data Processing, Evaluation, and Management

Electronic data collection records will be downloaded as possible and saved to the project files. Paper field records will be scanned and sent to the Data Management Task Manager. Survey data will be loaded into a GIS-based spatial database and added to the Study Area basemap.

Habitat survey information will be used along with water quality characteristic data obtained from the water column profiles and surface water sampling events (Section 10) to help identify which fish and wildlife species would be expected to be present within the Study Area.

Benthic community survey data will be compared through statistical analysis between events to determine if there are any significant seasonal or spatial differences in benthic composition, distribution, and biodiversity.

Fish survey data will be used to determine species presence, relative abundance, structure, biodiversity, use, and indices of the fish community during periods of low and acceptable DO levels. Fish community survey observations will be compiled for fish caught. The targeted locations and sampling methods (e.g., otter trawls and gillnets) to be used during the subsequent surveys will be dependent on the catch results of the first sampling event and survey. A summary of the species composition, total and relative abundance, and percent frequency of occurrence for fishes and shellfish (blue crab) captured by each gear type during the fish community survey will be prepared.

The data collected during these surveys will be used to assist in the development of the SLERA and BERA Problem Formulation.

12.4 Reporting

Shoreline survey information and other data collected from the habitat survey and biological evaluation will be included in the Phase 1 RI Data Report Summary Report and evaluated in the RI Report, SLERA, and BERA.

12.5 Schedule

The land-based and shoreline habitat survey are planned to be conducted the spring or summer of the Phase 1 RI Field Program to identify ecological habitat and wildlife resources. The schedule for the biological evaluations is dependent on DO conditions in the Study Area, with two rounds of sampling conducted, one in the late summer to reflect low DO levels, and one in the spring to reflect higher DO levels. The schedule will also be dependent on weather and field conditions.

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
DK003	999481.543	208192.6929	Dutch Kills, Lower Reach, Near Confluence with Newtown Creek	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location where sediment loading is occurring - Location of NYCDEP previous benthic sample location (Newtown Creek Waterbody Watershed Plan) Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
DK007	1000545.082	208859.9856	Dutch Kills, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Mid-way within tributary - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Upstream of stormwater outfall - Near location where sediment loading is occurring Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
DK011	1001089.061	209964.0173	Head of Dutch Kills	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Location of NYCDEP previous Benthic Macroinvertebrate Sample location (Newtown Creek Waterbody Watershed Plan) - At location of potential sediment loading Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
EB006	1005616.345	200206.3613	At Fork in East Branch	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At bend in waterbody; location where deposition may occur Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
EB008	1005175.831	199867.5134	Channel of East Branch, Upper Reach, Near Head of East Branch	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location of potential sediment loading - Location of NYCDEP previous Benthic Macroinvertebrate Sample location (Newtown Creek Waterbody Watershed Plan) Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
EK001	1004694.205	200884.3791	Near Shoreline of English Kills, Lower Reach, Near Confluence with East Branch and Newtown Creek	Benthic Macroinvertebrate Sample - Spatially along Study Area - Outside of dredged channel - Along transect perpendicular to banks, associated with sample inside of dredged channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
EK002	1004719.791	200818.7878	Channel of English Kills, Lower Reach, Near Confluence with East Branch and Newtown Creek	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside of dredged channel - Along transect perpendicular to banks, associated with samples outside of dredged channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
EK010	1003180.411	199770.0307	Near Shoreline of English Kills, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Outside of dredged channel where potential impact from shipping traffic expected to be lower - In potential depositional area Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
EK016	1003166.522	198584.7066	Channel of English Kills, Upper Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Downstream of stormwater outfall Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
EK021	1003415.709	197812.1642	Channel Near Head of English Kills	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - At location of potential sediment loading - Location of NYCDEP previous Benthic Macroinvertebrate Sample location (Newtown Creek Waterbody Watershed Plan) Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
MC002	1005531.231	203032.9007	Channel of Maspeth Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - Mid-way up tributary - In area where sediment loading is occurring Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses [2]
	Easting	Northing			
MC006	1005941.059	202987.2962	Channel of Maspeth Creek, Upper Reach, Near Head of Maspeth Creek	Benthic Macroinvertebrate Sample - Spatially along Study Area - Within tributary where DO level expected to be lower than in main channel of Newtown Creek - In area where sediment loading is occurring - Location of NYCDEP previous Benthic Macroinvertebrate Sample location (Newtown Creek Waterbody Watershed Plan) Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC002	995253.7507	207780.5987	Near Shoreline of Newtown Creek Near Confluence with East River	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC003	995070.6462	207948.7442	Channel of Newtown Creek, Near Mouth	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC004	995034.1653	208145.9183	Near Shoreline of Newtown Creek Near Confluence with East River	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC006	995768.6078	208203.3587	Near Shoreline of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC007	995680.9649	208329.6693	Channel of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside navigation channel, paired with samples outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1] Easting	Target Coordinates NAD 83[1] Northing	Location in Study Area[1]	Rationale	Analyses[2]
NC008	995618.734	208421.268	Near Shoreline of Newtown Creek, Lower Reach, Near Confluence with East River	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC017	997445.9149	208482.3448	Near Shoreline of Newtown Creek, Lower Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic - Upstream of outfall and Pulaski Bridge Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC018	997483.5541	208583.087	Channel of Newtown Creek, Lower Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC019	997484.0762	208674.8245	Near Shoreline of Newtown Creek, Lower Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC029	999486.168	207403.7088	Near Shoreline of Newtown Creek, Near Whale Creek	Benthic Macroinvertebrate Sample - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel where potential impact from shipping traffic expected to be lower Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC033	1000267.618	207214.1051	Near Shoreline of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - In location where NYCDEP performed plankton sampling and artificial substrate sampling - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC034	1000311.677	207284.2389	Channel of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside navigation channel, paired with samples outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC035	1000367.443	207363.2247	Near Shoreline of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC046	1001141.355	205537.0667	Channel of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - In transect adjacent to Respondent property - Inside navigation channel, paired with sample outside navigation channel to assess the impact of shipping traffic. - Within NYCDEP fish sampling reach Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC047	1001248.245	205584.1341	Near Shoreline of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - In transect adjacent to Respondent property - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC058	1003056.718	204685.9162	Channel of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - In transect adjacent to Respondent property - Downstream of stormwater outfall - Inside navigation channel, paired with sample outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC059	1003108.572	204767.6328	Near Shoreline of Newtown Creek, Middle Reach	Benthic Macroinvertebrate Sample - Spatially along Study Area - In transect adjacent to Respondent property - Downstream of stormwater outfall - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC069	1004468.981	202870.6412	Near Shoreline of Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Benthic Macroinvertebrate Sample - Near confluence of Maspeth Creek with Newtown Creek - Near boat turning basin (edges of area may be disturbed) - NYCDEP conducted benthic sampling in area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel where potential impact from shipping traffic expected to be lower. Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC071	1004835.206	202964.6631	Newtown Creek, Upper Reach, at Confluence with Maspeth Creek	Benthic Macroinvertebrate Sample - At confluence of Newtown Creek with Maspeth Creek to evaluate conditions at confluence - Near boat turning basin (edges of area may be disturbed) - Outside navigation channel where potential impact from shipping traffic expected to be lower Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC075	1004837.663	201940.1415	Near Shoreline of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Near end of turning basin - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Table 12-1
Benthic Sampling Stations, Rationale, and Analyses

Station ID	Target Coordinates NAD 83[1]		Location in Study Area[1]	Rationale	Analyses[2]
	Easting	Northing			
NC076	1005062.574	201997.2646	Channel of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Macroinvertebrate Sample - Spatially along Study Area - Inside navigation channel - Paired with samples outside navigation channel to assess the impact of shipping traffic Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List
NC077	1005213.768	202034.4408	Near Shoreline of Newtown Creek, Upper Reach, Between Confluence with Maspeth Creek and Confluences with East Branch and English Kills	Benthic Macroinvertebrate Sample - Spatially along Study Area - Along the shoreline, where water depth is expected to be shallower than in the navigation channel - Outside navigation channel, paired with sample inside navigation channel to assess the impact of shipping traffic - Near area of sediment accumulation Benthic Surface Water Sample - Collocated with benthic macroinvertebrate sample	BM = Benthic Macroinvertebrates BWS = Benthic Surface Water List

Notes:

1 - Sampling locations are approximate and may be modified based on field conditions, access issues, etc.

2 - Specific analyses that comprise the analyte groups described are provided in Table 12-2 for the benthic macroinvertebrates and associated surface water and in Table 7-1 for the surface sediment chemical and physical analyses.

NAD = North American Datum

BM = Benthic Macroinvertebrates

BWS = Surface Water Sample Associated with BM

Table 12-2
Fish Survey Area, Rationale, and Analyses

Survey Zone ID	River Mile		Location in Study Area[1]	Rationale
	Start	End		
FSZ1	NC 0.10	NC 0.67	From mouth of Newtown Creek extending approximately 3,000 ft up Newtown Creek	To capture area of higher DO at mouth of Newtown Creek
FSZ2	DK 0.03	DK 0.59	All of Dutch Kills	Within tributary where DO level expected to be lower than in main channel of Newtown Creek
FSZ3	NC 1.24	NC 1.71	An approxmately 2,000 ft reach of Newtwon Creek between Whale Creek and Maspeth Creek	To survey in area of where NYCDEP previously sampled
FSZ4	MC 0.09	MP 0.32	All of Maspeth Creek	Within tributary where DO level expected to be lower than in main channel of Newtown Creek
FSZ5	NC 2.68	EB 0.37 and EK 1.02	End of Newtown Creek and all of East Branch and English Kills	Within tributary where DO level expected to be lower than in main channel of Newtown Creek

Notes:
1 - Survey zones are approximate and may be modified based on field conditions, access issues, etc.
DK = Dutch Kills
DO = Dissolved Oxygen
EB = East Branch
EK = English Kills
ft = Feet
MP = Maspeth Creek
NC = Newtown Creek
NYCDEP = New York City Department of Environmental Protection

Table 12-3

Boat-Based Shoreline Habitat Survey Materials and Equipment

- 30-gallon (minimum) garbage bags
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Cell phone
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration [OSHA] and National Fire Protection Association [NFPA] Code 30 specifications/Factory Manual [FM] approved)
- Clipboard
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot

Table 12-3

Boat-Based Shoreline Habitat Survey Materials and Equipment

- Digital cameras
- Drum cart
- Drum wrench to tighten open-top drum lids
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
- Ethyl acetate
- High-pressure/steam cleaner (if required)
- IDW log form
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Navigation charts (electronic)
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-determined sampling coordinates/waypoints and locations figure
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Stainless steel bowls or pans (labeled as needed)
- Storage racks
- Study Area maps
- Tap water source (any treated municipal water supply)
- Three-ring binder or equivalent
- Time piece
- Zipper-lock bags

See the following SOPs for further details:

Table 12-3

Boat-Based Shoreline Habitat Survey Materials and Equipment

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal

Table 12-4

Land-Based Habitat Survey Materials and Equipment

- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Black, ballpoint pen or Sharpie® (or equivalent)
- Bound, waterproof field logbooks
- Cell phone
- Clipboard
- Digital cameras
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and personal protective equipment (PPE) (refer to the Health and Safety Plan [HASP] [Anchor QEA 2011a])
- Hand-held electronic recording device (optional)
- Printer/scanner
- Study Area maps
- Three-ring binder or equivalent
- Time piece

See the following SOPs for further details:

- NC-01 Field Records

Table 12-5
Benthic Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (mL)	Container	Preservation Requirements	Lab	Number of Locations	Volume To Specific Labs	Preservative
Surface Water Benthic List							
Total and Dissolved Phosphorus (SM4500)	250	250 mL HDPE	0-6°C; 0.5 mL H_2SO_4 per 250 mL container	Alpha Analytical 320 Forbes Boulevard Mansfield, MA 02048	34	250 mL	0-6°C; 0.5 mL H_2SO_4 per 250 mL container
Ammonia-N (350.1)	100	125 mL HDPE	0-6°C; H_2SO_4 to pH < 2		34	220 mL	0-6°C; H2SO4 to pH < 2
TOC (SM5310C)	120	3 x 40 ml voa vial	0-6°C; H_2SO_4 to pH < 2		34		
DOC (SM5310C)	200	3 x 250 mL glass	0-6°C; store in the dark		34	200 mL	0-6°C; store in the dark
Total and Dissolved Nitrogen (Alpha TKN + NO3/NO2)	750	3 x 250 mL HDPE	0-6°C		34	750 mL	0-6°C
TDS (160.1)	1000	1 L HDPE	0-6°C		34	1000 mL	0-6°C
SSC (ASTM D3977)	1000	One tared 1 L HDPE	0-6°C; store in the dark; weigh entire sample bottle to nearest 0.1 g and record weight upon receipt at laboratory	GeoTesting Express 1145 Massachusetts Ave. Boxborough, MA 01719	34	1000 mL	0-6°C; store in the dark
Total Minimal Volume (mL)						**3420**	

Table 12-5
Benthic Analyses, Sample Containers, and Laboratories for Analysis

Analytical Group	Minimal Volume (mL)	Container	Preservation Requirements	Lab	Number of Locations	Volume To Specific Labs	Preservative
Surface Sediment Benthic - Macroinvertebrate Grabs							
Benthic Invertebrates	500	1 or 2 x 1 L wide-mouth plastic containers (coarse material will require 2 jars)	0-6°C; add 50 -100mL of 10% buffered formalin solution	Watershed Assessment Associates, LLC 28 Yates Street Schenectady, NY 12305	34	1,500g	0-6°C; add 50 - 100mL of 10% formaldehyde
Total Minimal Volume (g)						**1,500 g**	

Table 12-6

Benthic Survey Materials and Equipment

- 1-L Plastic field sampling buckets (3)
- 500 micron sieves
- 9% Formalin
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal)
- Appropriate winch and cable to deploy grab sampler in deep waters
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including ground tackle, and required U.S. Coast Guard safety gear
- Borax
- Bound, waterproof field logbooks
- Bristle brushes
- Cell phone
- COC forms (electronic)
- Clear plastic sealing tape
- Clipboard
- Collection buckets
- Custody tape or seals
- Custody transfer forms
- Decontamination supplies (refer to NC-02 - Equipment Decontamination)
- Deionized (DI) "analyte-free" water

Table 12-6

Benthic Survey Materials and Equipment

- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Eckman sampler, modified Eckman sampler, modified Van Veen sampler, Petit Ponar sampler, or similar sampling device
- Equipment user manuals
- Extra weights for the grab sampler; extra pins, and a mudshoe to keep the grab from overpenetrating. Ropes and tie wraps to attach mudshoe when necessary
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Funnels
- Glass bowl for homogenizing sediment sample for total organic carbon (TOC) and grain size analysis
- Grab sampler: Pondar, Ted Young modified Van Veen grab, or similar
- Hand-held electronic recording device (optional)
- Hexane (pesticide grade or better)
- High-pressure/steam cleaner (if required)
- Ice
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated containers/coolers
- Joy® (or equivalent) detergent (for oily residues)
- Marine VHF (high frequency) radio
- Ethyl acetate
- Navigation charts (electronic)
- Navigational equipment
- Overnight courier airbills or shipping forms
- Parafilm
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)
- Photoionization detector (PID)/toxic gas sensor (refer to HASP)
- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-determined sampling coordinates/waypoints and locations figure

Table 12-6

Benthic Survey Materials and Equipment

- Pre-labeled and pre-preserved sample bottles for equipment rinseate samples
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)Ruler and tape measures
- Sample labels
- Sampling vessel, with a fathometer and DGPS, capable of deploying grab apparatus with sufficient room for all aspects of grab sampling (e.g. sieving, cleaning). Sufficient room must also be available for the storage of collected samples
- Sealing tape
- Sediment Grab Collection Record and other standardized forms (as needed)
- Shipping tape
- Siphon tubing and bucket
- Squeeze and/or spray bottles
- Stainless steel bowls and spoons/spatulas (or equivalent)
- Stand (cradle) on which to place the grab sampler while not in deployment
- Standardized field data forms (hard copy and/or electronic)
- Study Area maps
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Water pump and hoses
- Wooden base or stand for grab sampler
- Zipper-lock bags

See the following SOPs for further details:

- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-05 Sediment Grab Sampling
- NC-13 Sample Custody

Table 12-6

Benthic Survey Materials and Equipment

- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal
- NC-22 Benthic Community Survey

Table 12-7
Fish Survey Materials and Equipment

- 30-gallon (minimum) garbage bags
- 5-10 gallon carboys to be used as satellite waste collection containers
- 55-gallon closed-top drums (Department of Transportation [DOT] approved) for collection of liquids
- 55-gallon open-top drums (DOT approved) with lid for collection of solids and personal protective equipment (PPE)
- 5-gallon buckets with lids
- Acid and solvent spill kits
- Aluminum foil
- Appropriate waste disposal containers and equipment (refer to SOP NC-15 – Investigation-Derived Waste [IDW] Handling and Disposal)
- Approved documents including:
  - Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan) (AECOM 2011)
  - Health and Safety Plan (HASP) (Anchor QEA 2011a)
  - Field Sampling and Analysis Plan (FSAP) (see main report)
  - Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b)
  - Data Management Plan (DMP) (Anchor QEA 2011c)
  - Standardized forms as needed.
- Assorted nautical equipment (e.g., anchors, lines, personal flotation devices)
- Bags for Chains of Custody (COC)
- Black, ballpoint pen or Sharpie® (or equivalent)
- Boat(s) adequately sized and equipped for the task and expected conditions in the Study Area, including global positioning system (DGPS) navigational equipment, ground tackle, and required U.S. Coast Guard safety gear
- Bound, waterproof field logbooks
- Bristle brushes
- Bung tool to open closed-top drums
- Buoys, polyballs, assorted line, and anchors/weights
- Cell phone
- COC forms (electronic)
- Chemical drums
- Chemical storage cabinet (meeting Occupational Safety and Health Administration

Table 12-7

Fish Survey Materials and Equipment

[OSHA] and National Fire Protection Association [NFPA] Code 30 specifications/Factory Manual [FM] approved)

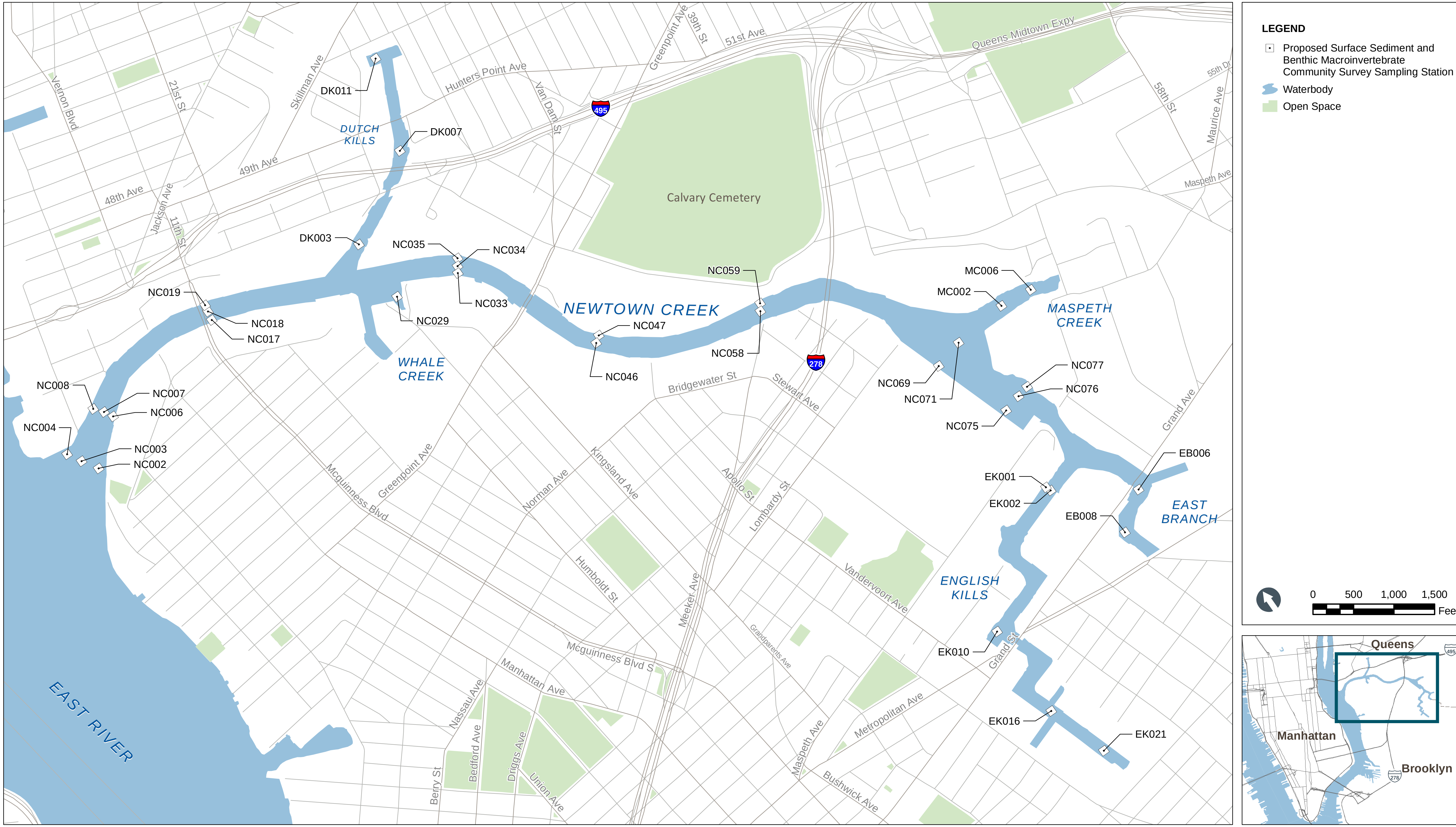
- Clipboard
- Connective (serial) cabling and data logger
- Custody tape or seals
- Deionized (DI) "analyte-free" water
- Differential Global Positioning System (DGPS) External Antennas (x2)
- DGPS Receivers (x2) with an accuracy of ±1 foot
- Digital cameras
- Drum cart
- Drum wrench to tighten open-top drum lids
- Equipment user manuals
- Field computer (Panasonic Toughbook handheld tablet computer, or similar)
- First aid kit and PPE (refer to the HASP [Anchor QEA 2011a])
- Fixed water level measurement and recording gauges
- Hand-held electronic recording device (optional)
- Hexane (pesticide grade or better)
- High-pressure/steam cleaner (if required)
- Ice
- IDW log form
- Inert packing material (e.g., vermiculite, cardboard, bubblewrap, etc.)
- Insulated coolers
- Joy® (or equivalent) detergent (for oily residues)
- Labels and tags
- Marine VHF (high frequency) radio
- Measuring boards, scales, fish baskets, and miscellaneous processing gear
- Ethyl acetate
- Multi-parameter Water Quality Meter (YSI, Horiba, or equivalent) equipped with probes for temperature, salinity, dissolved oxygen (DO), pH, oxidation reduction potential (ORP), and conductivity
- Navigation charts and sampling locations figure
- Overnight courier airbills or shipping forms
- Pallets
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)

Table 12-7
Fish Survey Materials and Equipment

- Plastic sheeting and duct tape
- Plastic wash/rinse buckets or tubs
- Pre-determined sampling coordinates/waypoints and locations figure
- Pre-labeled and pre-preserved sample bottles for equipment rinseate samples
- Pre-labeled and pre-preserved sample bottles for the analyses specified in FSAP (see main report) and QAPP (Anchor QEA 2011b)
- Printer/scanner
- Real Time Kinematic (RTK) DGPS positioning system (optional)
- Ruler and tape measures
- Sample labels
- Sampling gear (i.e., otter trawls, gill nets, baited minnow/eel traps, baited crab traps, and trot lines or pots)
- Sealing tape
- Shipping tape
- Small (cooler-size) storage containers
- Squeeze and/or spray bottles
- Stainless steel bowls or pans (labeled as needed)
- Storage racks
- Study Area maps
- Tap water source (any treated municipal water supply)
- Temperature blanks (if not provided by the laboratory)
- Three-ring binder or equivalent
- Time piece
- Zipper-lock bags

See the following SOPs for further details:

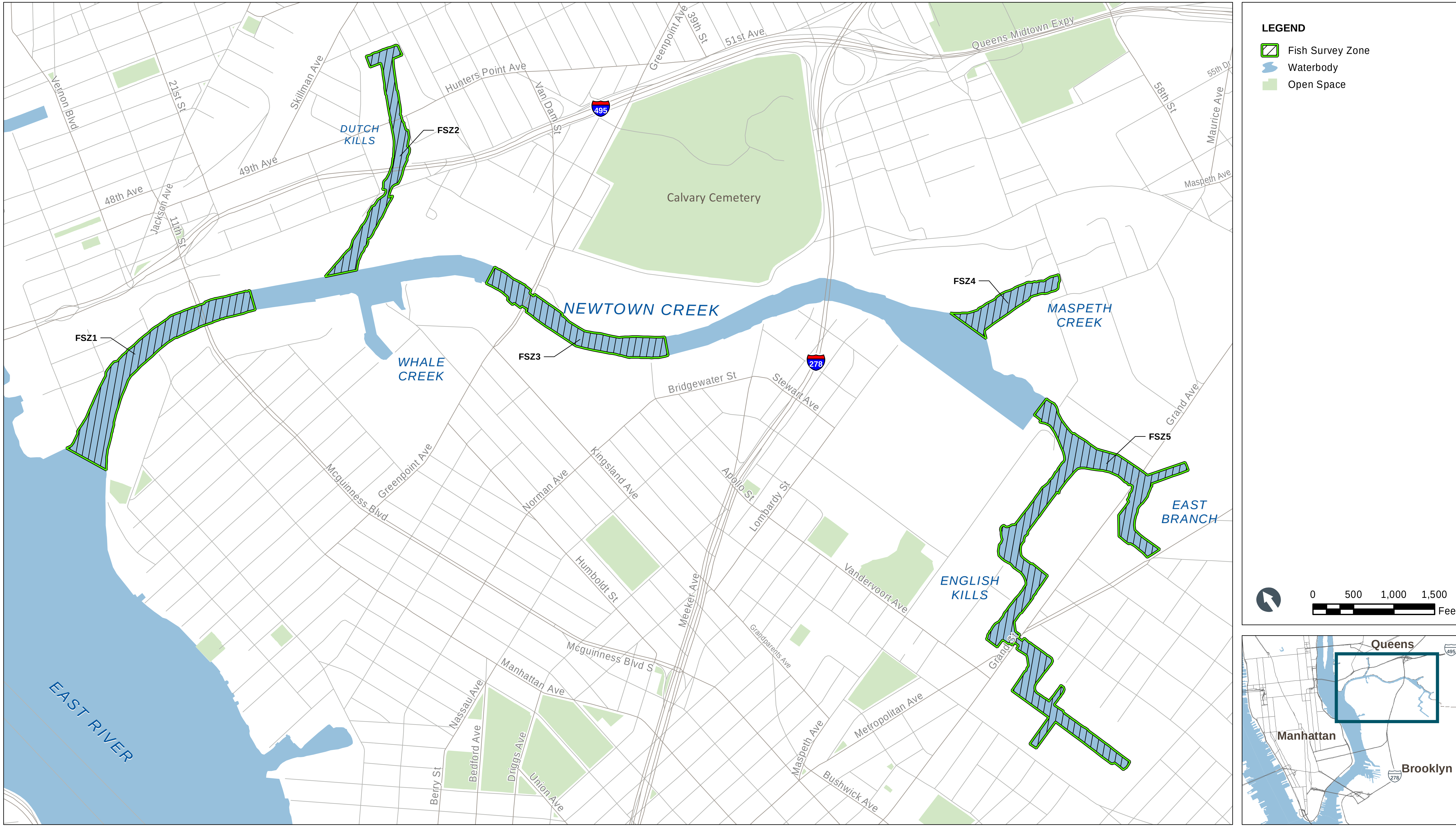
- NC-01 Field Records
- NC-02 Equipment Decontamination
- NC-04 Navigation/Boat Positioning
- NC-13 Sample Custody
- NC-14 Sample Packaging and Shipping
- NC-15 Investigation-Derived Waste (IDW) Handling and Disposal
- NC-18 Fish Community Survey



ANCHOR QEA

Note:
Proposed sampling stations are approximate and may be modified based on field conditions, utilities, access issues, etc.

Figure 12-1
Proposed Benthic Macroinvertebrate Community Survey Sampling Stations
Field Sampling and Analysis Plan
Newtown Creek RI/FS



ANCHOR QEA

Note:
Proposed sampling locations are approximate and may be modified based on field conditions, access issues, etc.

Figure 12-2
Fish Community Survey Zones
Field Sampling and Analysis Plan
Newtown Creek RI/FS

Q:\Jobs\110782-01_NewTownCreek\Maps\2011_Plans\FSAP\AQ FSAP Figure 12-2 Fish Community Survey Zones.mxd lhudson 10/14/2011 3:35:11 PM

13 QUALITY ASSURANCE/QUALITY CONTROL

This section describes the QA/QC procedures that will be followed during the implementation of the Phase 1 RI Field Program.

13.1 Field Quality Control Samples

Field QC samples will include trip blanks, field duplicates, matrix spike/matrix spike duplicates (MS/MSDs), and equipment rinsate blanks. Laboratory analysis of field duplicates and rinsate blanks will be used to evaluate the precision and accuracy of field sampling techniques. Field duplicate samples and MS/MSD samples will be co-collected with project samples. Field duplicate samples will be analyzed at a rate of one per twenty project samples (5%) for each matrix and method. MS/MSD samples will be collected at a rate of at least one MS/MSD sample per extraction batch and at least one per twenty samples (5%) for each matrix and method. Collection of the rinsate blanks will be conducted on each distinct non-dedicated sample apparatus (e.g., core liners, grab sampler, and stainless steel bowl) at a rate of one per 20 samples or one per day whichever is least frequent. Trip blanks will serve as an indicator of container cleanliness, external contamination, and contamination from analytical procedures. Trip blanks will accompany all water and sediment shipments, at a frequency of one per shipment, containing samples for volatile analysis. QC samples will be collected in accordance with the project QAPP (Anchor QEA 2011b) and applicable sampling procedures presented in this FSAP.

Field QC samples will be collected and labeled in the same manner as primary analytical samples (refer to Section 14.2.1). All field QC samples will be collected, handled, documented, preserved, packaged, and shipped using the same techniques as for all other samples. QAPP (Anchor QEA 2011b) Worksheet #20 (Field Quality Control Sample Summary Table) provides a summary of the anticipated QC samples to be collected in the field. The final number of QC samples per media will be determined based on field conditions and the sequence of sampling implemented in the field.

The QC procedures for measuring direct-read parameters will include initial calibration of the field instruments and checking the calibration to a reference standard as needed throughout the sampling period. Field personnel are responsible for proper calibration of field instruments throughout the RI Program as described in SOPs NC-07 – Calibration and Operation of a Portable Hydrogen Sulfide Monitor, NC-16 – Photoionization Detector Calibration and Operation, and NC-17 – Multi-Parameter Water Quality Data Collection.

13.2 Site Audits/Management Site Visits

Planned and documented performance audits may be conducted for both field and laboratory operations to assess the accuracy of the measurement systems and to determine the effectiveness of QA/QC procedures and compliance with the Newtown Creek RI/FS SOPs. The laboratory audit(s) will be conducted internally by the Laboratory QAO (refer to the project QAPP [Anchor QEA 2011b]). Field performance audits should be conducted by the Anchor QEA Project QA Coordinator and/or Field Team Leader.

A field audit may be scheduled at the discretion of the RI Manager and/or Project QA Coordinator to observe and review field procedures and documentation from sample collection through packaging and shipment to the laboratories. Auditors will be independent of any direct responsibility for performance of the activities that will be audited. Audits will be scheduled to provide coverage and coordination with all ongoing project activities and as early in the program as practical. The RI Manager will be responsible for identifying an appropriate schedule and frequency for audits prior to commencement of investigation activities.

Field audits will be performed in accordance with written procedures or checklists. The field audit will involve the review and evaluation of, as appropriate, implementation of approved work procedures, sampling procedures, sampling documentation, and specifications; calibration and operation of equipment; labeling, packaging, storage, and shipping of samples; completion of field records; QC compliance; subcontractor performance; and field change documentation. Field records will also be reviewed to verify that field-related activities are performed and documented in accordance with approved project plans and applicable SOPs. Items to be reviewed include, but are not limited to, field equipment calibration records, field activity logs, standardized collection forms, custody transfer forms and COCs, field measurement logs, and waste inventory logs.

Preliminary results of the audits will be reviewed with the RI Manager to ensure that deficiencies adversely affecting data quality are immediately corrected. Audit findings will be reviewed to determine the cause of any noncompliance issues identified, schedule corrective action to prevent recurrence, evaluate the impact of the findings on completed work, and notify the Field Team Leader or designee and the Project QA Coordinator in a written report of action taken or planned. The Field Team Leader or designee and the Project QA Coordinator will be responsible for verifying and documenting completion of the correction action.

USEPA may also perform external audits and require split samples. Should split samples be required, the nomenclature for sample designation would follow the nomenclature presented in Section 14 of this FSAP.

14 DOCUMENTATION AND SAMPLE MANAGEMENT

This section describes how data and documents will be archived and how samples will be named and handled.

14.1 Documentation

Data will be collected and recorded in a variety of ways during this project including the use of standardized paper, electronic field forms, photographic documentation, electronically recorded field measurements (i.e., data from current meters), and laboratory-generated data. Field records will be created and maintained in accordance with NC-01 – Field Records.

Original data documents and interchange files will be archived in the appropriate hard copy or electronic project filing system, according to the project-specific storage and retention policies. Access will be restricted to project personnel, and the ability to view and/or add or change data will be granted to only those individuals identified and trained to perform those tasks. Additional information on data management is discussed in the DMP (Anchor QEA 2011c).

14.2 Sample Management

This section describes how samples will be named and handled during the Phase 1 RI Field Program.

14.2.1 Sample Nomenclature

In order to facilitate proper identification of Study Area locations and sample names, a project naming convention or sample nomenclature has been developed. Each sample, including field samples and QC samples (e.g., trip blanks, equipment rinsate blanks, field duplicates) will be assigned a unique identification based on station location, sample media, and type of sample. This naming convention will facilitate proper linking of sample data to map locations and laboratory data.

Samples will be uniquely identified at the time of collection. Nomenclature is {station identification}{matrix code}-{depth}-{date}

- Station identification = 5-character identifier for the station. The identifier will begin with a 2-character identifier to indicate whether the station is located in Newtown Creek or a tributary and will be followed by a 3-digit number that indicates the position. Field duplicates will be identified by adding 1000 to the 3-digit position number. The character codes are as follows:
  - NC = Newtown Creek
  - DK = Dutch Kills
  - WC = Whale Creek
  - MC = Maspeth Creek
  - EB = East Branch
  - EK = English Kills
- Rinsate and trip blanks will not require a station identifier.
- Matrix code = 2-character code to indicate the sample matrix. Matrix codes are as follows:
  - SC = Chemistry sediment core
  - GC = Geochron sediment core
  - SG = Sediment grab
  - SF = SedFlume core
  - SW = Surface water
  - TP = Tidal profile
  - AR = Air
  - RB = Rinsate blank
  - TB = Trip blank
  - FB = Field Blank (air only)
- Depth:
  - Sediment samples = 7-character identifier indicating the depth in centimeters from where the samples were collected. The first 3 characters will indicate the top of the interval, the last 3 characters will indicate the bottom of the interval, and the two will be separated by a hyphen (###-###).
  - Depth, water = Surface waters will be designated by three depth indicators:
    - A = Near surface

  - B = Middle
  - C = Near bottom

- Air samples, rinsate blanks, and trip blanks will not require a depth identifier.
- Date = 8-character code to indicate the date the sample was collected in the format YYYYMMDD.

For example:

- A chemistry core sample collected at the 26th station of the main Newtown Creek area with a depth of 198 to 297 cm collected on September 8, 2011 would have the id: NC026SC-198-297-20110908
- The duplicate of this sample would have the id: NC1026SC-198-297-20110908
- A sediment grab collected at the fifth station of the Dutch Kills area with a depth of 0 to 15 cm collected April 27, 2012 would have the id: DK005SG-000-015-20120427
- A surface water sample collected in the upper water column of Maspeth Creek at the first station on May 16, 2012 would have the id: MC001SW-A-20120516
- A rinsate blank collected in association with chemistry core sampling collected on June 1, 2012 would have the id: SC-RB-20120601

14.2.2 Sample Custody

Procedures to ensure the custody and integrity of the samples begin at the time of sample collection and continue through analysis and sample disposal. From the time of collection through transportation and delivery to the laboratory, the handling of samples will follow proper COC procedures as described in NC-13 – Sample Custody.

14.2.3 Sample Handling and Shipment

Sample packaging and shipment must be completed to appropriately isolate the samples, maintain the required temperature, and to limit the potential for damage to sample containers when the cooler is transported. Sample handling, packaging, and shipping activities will follow the procedures outlined in NC-14 – Sample Packaging and Shipping.

15 INVESTIGATION-DERIVED WASTE MANAGEMENT

Potentially contaminated sediment, water, PPE, and other IDW materials will be generated during implementation of the Phase 1 RI Field Program. All IDW will be handled and disposed of in accordance with the procedures in NC-15 – Investigation-Derived Waste (IDW) Handling and Disposal and in compliance the Off-Site Rule, set forth in the *National Contingency Plan* at *40 CFR 300.440*. Waste management and disposal will be managed by personnel with Resource Conservation and Recovery Act (RCRA) hazardous waste management training. IDW will be classified into three categories: 1) solid materials consisting of sediments, sediment samples returned from the laboratory, used polybutyrate core tubes, used PPE, and other materials used in the handling, processing, and storage of sediment; 2) liquid wastes such as waste creek water and decontamination water; and 3) spent and residual chemicals (liquids) from the decontamination process. To the extent practical, liquids generated during coring and core processing operations will be separated from the solid material.

15.1 Solid Waste

Solid residuals consist of two types of materials: sediment and non-sediment solids. Sediment wastes include material in discarded cores or grab samples and excess sediment not used for sample analyses. Non-sediment wastes generated during the collection and processing of cores include items such as used core liners and caps, aluminum foil, PPE, and plastic sheeting. Non-sediment and sediment wastes will be segregated and stored in separate properly labeled 55-gallon drums pending characterization and disposal. Non-sediment solid waste may also be placed in bulk bags for temporary storage.

15.2 Waste Water

Waste water will be generated during sediment core processing, benthic sediment sampling preparation, and decontamination activities. Waste water will be collected in a large storage tank at the field facility or in a properly labeled 55-gallon (closed-top) drums pending characterization and disposal.

15.3 Chemical Waste

Chemical liquid wastes may be generated during equipment decontamination activities and include spent solvents and acids (refer to NC-02 – Equipment Decontamination). Waste acids and solvents will be collected in (dedicated) satellite containers as follows:

- Waste acids (i.e., nitric acid) will be collected in a plastic storage carboy (20-L) SEPARATE FROM WASTE SOLVENTS, labeled with a Class 8 Corrosive Liquid label and contain a tag that indicates acid name, concentration, and volume along with users initials, and date/time.
- Waste solvents (e.g., methanol and ethyl acetate) will be collected in (jacketed) glass solvent bottles SEPARATE FROM WASTE ACIDS, labeled with a Class 3 Flammable Liquid label and contain a tag that indicates solvent name, concentration, and volume along with users initials, and date/time.

Chemical waste containers will be stored in a secure location at the field processing area until pickup by an authorized waste handler at the end of the field phase. Drums or containers of hazardous waste will be removed from the facility within the time mandated for the governing hazardous waste generator status (large quantity generator, small quantity generator, or conditionally exempt generator).

15.4 Drum Handling

The following procedures will be followed for storing solid and liquid waste in drums. Drum handling procedures specific to chemical wastes are provided in previous sections.

- A unique drum number (consisting of the program ID and the sequential number) will be assigned to each drum and the drum number will be clearly marked on the drum.
- A label indicating that the drum contains IDW pending characterization will be placed on each drum. Information on the label will include the drum number, type of material (sediment, waste water, or non-sediment solids), start and end dates of generation, project number, and contact information.
- A log will be kept for each drum, listing the materials placed in that drum. All solid materials will be segregated based on the type of material (i.e., sediment, core liners, and PPE/plastic/misc.) and, to the extent practicable, by where they were generated

(e.g., location within the Study Area or station number and process area).

- Drums will be kept closed at all times except when material is being added to them.
- Drums will be sealed (bungs or lid bands tightened) when not in active use.
- Drums will be stored in a secured area until proper disposal at an authorized facility can be coordinated.
- Prior to the disposal of IDW, USEPA will be informed of the intended disposal facility that will be receiving waste, the quantity of waste to be disposed of, and the entity responsible for transporting the waste.

16 REFERENCES

AECOM, 2011. *Remedial Investigation/Feasibility Study Work Plan*. June.

Anchor QEA, 2011a. *Health and Safety Plan*, Newtown Creek. July.

Anchor QEA, 2011b. *Quality Assurance Project Plan*, Newtown Creek. July.

Anchor QEA, 2011c. *Data Management Plan, Newtown Creek*. July.

Anchor QEA, 2011d. *Community Involvement Plan, Newtown Creek*. July.

Anchor QEA, 2011e. *Data Collection Plan*, Newtown Creek.. July.

Anchor, 2007. *DRAFT Remedial Investigation Report, Operable Unit 6, Site, Laurel Hill Site Maspeth*, New York, May.

ANSI/ASQC, 1994. ANSI/ASQC E4-1994, Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs and NELAP.

Hazen and Sawyer, 1981. May – October 1980 Monitoring Program: Newtown Creek Water Pollution Control Plant Application for Modification of the Requirements of Secondary Treatment under Section 301(h) of PL 95 217. Prepared for City of New York Department of Environmental Protection.

Lawler, Matusky and Skelly Engineers (LMS), 1991. Newtown Creek Water Quality Facility Planning Project-Subtask 2.1 Shoreline Survey and Outfall Characterization, Draft, Prepared for the NYC Department of Environmental Protection by Lawler, Matusky and Skelly Engineers. August.

LMS, 1992. Newtown Creek Water Quality Facility Planning Project-Subtask 2.3 and 2.4 Sewer System Monitoring and Rainfall Monitoring, Final, Prepared for the NYCDEP by Lawler, Matusky and Skelly Engineers. February, 1992.

New York City Department of City Planning, 1992. New York City Comprehensive Waterfront Plan.

New York City Department of City Planning, 2002. New York City Waterfront Revitalization Program.

New York City Department of Sanitation, 2005. *Comprehensive Solid Waste Management Plan Final Environmental Impact Statement*. April 2005. Available at http://www.nyc.gov/html/dsny/html/swmp/swmp-5apr-feis.shtml.

New York City Economic Development Corporation, 2004. *Cross Harbor Freight Movement Project Draft Environmental Impact Statement.* April 2004. Available at http://crossharborfreight.net/view.htm.

New York City Planning Commission, 2005. *Greenpoint-Williamsburg Rezoning Final Environmental Impact Statement.* March 2005. Available at http://home2.nyc.gov/html/dcp/html/greenpointwill/eis.shtml.

New York City Department of Environmental Protection (NYCDEP), 2007. City-wide Long Term CSO Control Planning Project, Newtown Creek, Waterbody/Watershed Facility Plan Report. City of New York Department of Environmental Protection Bureau of Engineering Design and Construction, Draft. June.

NYCDEP, 2009. *Joint Application for the Water Pollution Control Plant Maintenance Dredging of Newtown Creek and Whale Creek Canal.* Newtown Creek Water Pollution Control Plant. Maintenance Dredging of Newtown Creek and Whale Creek Canal. Prepared for US Army Corps of Engineers and New York State Department of Environmental Protection. December 2009.

New York State Department of Environmental Conservation (NYSDEC), 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* http://www.dec.ny.gov/docs/water_pdf/togs111.pdf.

NYSDEC, 2010. *Draft DER-10 Technical Guidance for Site Investigation and Remediation.* New York State Department of Environmental Conservation. Division of Environmental Remediation. December 25.

New York State Department of Transportation (NYSDOT), 2005. Newtown Creek Navigation Analysis. September.

NYSDOT, 2009. Land Surveying Standards and Procedures Manual. February 4.

URS, 2003. *Newtown Creek Water Quality Facility Planning Project-Final Facility Plan Report,* Prepared for the NYCDEP, September.

U.S. Army Corps of Engineers (USACE), 2009. U.S. Army Corps of Engineers 2009 bathymetric survey of Newtown Creek.

U.S. Environmental Protection Agency (USEPA), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. October 1988. EPA/540/G-89/004. Office of Emergency and Remedial Response. Washington D.C.

USEPA, 1994. *ARCS Assessment Guidance Document*. EPA 905-B94-002. Chicago, Ill.: Great Lakes National Program Office.

USEPA, 1996. Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels. U.S. Environmental Protection Agency Office of Water Engineering and Analysis Division (4303) 401 M Street S.W. Washington, D.C. 20460. July 1996.

USEPA, 1999a. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). In: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, 2nd Edition. EPA/625/R-96-010b. January.

USEPA, 1999b. Compendium Method TO-10A, Determination Of Pesticides And Polychlorinated Biphenyls In Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed By Gas Chromatographic/Multi-Detector Detection (GC/MD), 2nd Edition. EPA/625/R-96-010b. January.

USEPA, 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications.* EPA-454/R-99-005. February.

USEPA, 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual.* EPA 823-B-01-002. U.S. EPA, Office of Water, Washington, DC.

USEPA, 2003. *Sediment Quality of the NY/NJ Harbor System: A 5-Year Revisit. An investigation under the Regional Environmental Monitoring and Assessment Program (REMAP)*. EPA/902-R-03-002.

USEPA, 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* U.S. Environmental Protection Agency, Washington, D.C. EPA-540-R-05-012, OSWER9355.0-85. December. Available at: http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

USEPA, 2006. *Guidance on Systematic Planning using the Data Quality Objective Process.* EPA/240/B-06/001. QA/G-4. February.

Weston Solutions, 2009. *Expanded Site Inspection Report Newtown Creek* Brooklyn/Queens, New York, CERCLIS ID No.: NYN000206282, EPA Contract No. EP-W-06-072, W.O. No. 20405.012.013.0524.00 Document Control No. 524-2A-AEFX. Prepared by Weston Solutions, Inc. Edison, NJ. Prepared for U.S. Environmental Protection Agency. July 2009.

ATTACHMENT 1
NEWTOWN CREEK STANDARD OPERATING PROCEDURES

INDEX OF SOPS

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SOP NC-02	Equipment Decontamination
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SOP NC-24	Land-side Habitat Survey

ATTACHMENT 1-NC-01

STANDARD OPERATING PROCEDURE FOR FIELD RECORDS

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: September 20, 2011

STANDARD OPERATION PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) addresses the sampling program requirements for the documentation of field activities. Field documentation will consist of sample collection forms, electronic field forms, photographs, and electronically recorded field measurements. Information regarding electronic data management is discussed in the Data Management Plan (Anchor QEA 2011b).

Equipment and Supplies

- Daily Activity Logs
- Chain-of-Custody (COC) forms
- Field forms/records
- Field Change Reports
- Waterproof pen
- Camera
- Electronic field application (if applicable)

Documentation Procedures

Field Forms

Field team members will keep a daily record of significant events, observations, and measurements on field forms. All field activities will be recorded on forms specific to the collection activity and will be maintained by the Field Team Leader. Field notes should be maintained for all field activities, whether the collection of samples or the gathering of environmental data. The on-site field representative will record on the field log forms information pertinent to the investigation, including, at a minimum, the following information:

- Project name
- Field personnel on site
- Facility visitors
- Health and safety discussions
- Sample station number
- Date and collection time of each sediment sample

- Observations made during sample collection including weather conditions, complications, vessel traffic, and other details associated with the sampling effort
- Sampling method and description of activities
- Any deviations from the Field Sampling and Analysis Plan (FSAP; Anchor QEA 2011a)
- Conferences associated with field sampling activities

In addition to maintaining a daily field log, sample collection forms will be completed for each sample. The sample collection forms will include standard entries for station identifier, station coordinates, date and time of sample location, type of samples collected, type of analyses for each sample, and specific information pertaining to the matrix being collected. Additional specific field reporting requirements and checklists for each study are defined in the respective SOPs. In general, sufficient information will be recorded during sampling so that reconstruction of the event can occur without relying on the memory of the field personnel.

Field notes should be kept on water-resistant paper and all field documentation will be made using an indelible, waterproof ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank pages or lines in the field logbook will be lined-out, dated, and initialed at the end of each sampling day. The field forms will be scanned into Anchor QEA's project file directory as convenient during the sampling event or upon completion of each sampling event.

COC Forms

The documentation of COC forms is described in SOP NC-13 – Sample Custody.

Sample Identification

The station and sample nomenclature is described in the FSAP.

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SOP NC-22	Benthic Community Survey
SOP NC-23	Shoreline Habitat Survey
SOP NC-24	Land-side Habitat Survey

References

Anchor QEA, 2011a. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Data Management Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

List of Attachments

Attachment 1 – Daily Log

Attachment 2 – Field Change Report

Attachment 3 – Visual Observation Log

Daily Log

ANCHOR QEA

Anchor QEA L.L.C.
305 W. Grand Ave Ste 300
Montvale, NJ 07645
Phone 201.930.9890 Fax 201.930.9805

PROJECT NAME: Newtown Creek RI **DATE:**

SITE ADDRESS: **PERSONNEL:**

WEATHER:	**WIND FROM:**	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
		SUNNY		CLOUDY		RAIN			?	**TEMPERATURE:**	° F .	° C

[Circle appropriate units]

TIME	COMMENTS
See Notes on bottom of page for detailed logging	
Equipment on site:	
Visual Survey: (seeps, overland flow, flow from outfalls, impacts, floatables)	
Samples delivered to lab:	

Notes: Work performed, Phone calls made, Problems Issues/Resolutions, Visitors on site, Deviations from the Workplan
Safety infractions, Important comments/instructions to contractors

Signature: ____________________

Field Change Report

ANCHOR QEA

Anchor QEA L.L.C.
305 W. Grand Ave Ste 300
Montvale, NJ 07645
Phone 201.930.9890 Fax 201.930.9805

PROJECT NAME: Newtown Creek RI

MATERIAL TO BE SAMPLED:

PERSONNEL:

Standard Procedure for Field Collection and Laboratory Analysis:

Reason for Change in Field Procedure or Analysis Variation:

Variation from Field or Analytical Procedure:

Special Equipment, Materials or Personnel Required:

Initiator's Name:	Date:
Project Officer:	Date:
QA Officer:	Date:

ANCHOR QEA

Visual Observations Log Form

Date ______________________

Location: ______________________

Project Name: ______________________ **Project Number:** ______________________

Monitoring Period: ______________________

Time Observations Started: ______________________ **Time Observation Concluded:** ______________________

Weather Conditions: ______________________

Wave Action Observations: ______________________

Photographs Taken: Yes No

Tidal Conditions: High Low Ebb Slack Flood

Observations of Erosion/Deposition: ______________________

Observations of Longterm Controls (i.e., oil booms, organo-clay mat, etc.) ______________________

Human Activity Observations (include activity, number of individuals engaged in activity, and approximate duration in hours):

Recreational: ______________________

____

Occupational: ______________________

____

Other Comments:

Recorded by: ______________________________

ATTACHMENT 1-NC-02

STANDARD OPERATING PROCEDURE EQUIPMENT DECONTAMINATION

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the decontamination of sampling equipment, instruments, and other materials used during implementation of field tasks for the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Decontamination is the process of neutralizing, washing, and rinsing field sampling equipment to clean field equipment and minimize the potential for sample cross-contamination.

Procedures for equipment decontamination outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP; Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Specialized training is not required for decontamination of equipment; however, field staff will be supervised by experienced staff.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Personal protective equipment (PPE) as required by the HASP
- Scrub brushes
- Plastic wash/rinse buckets or tubs
- Phosphate-free biodegradable detergent (e.g., Liquinox®, Alconox®)

- Ethyl acetate
- Deionized (DI) water
- Spray bottles
- Aluminum foil
- Tap water source (any treated municipal water supply)
- Investigation-derived waste (IDW) storage containers (refer to SOP NC-15)

Procedures for Decontamination of Sampling Equipment

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with sample media must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the sample medium will be decontaminated prior to use in the field.

The following steps will be used to decontaminate supporting equipment such as boats, lines, ropes, buoy marker weights, and current meters that are not in direct contact with samples or sediment:

1. Equipment will be rinsed with ambient water onboard the boat
2. Rinse water will not be contained
3. All sediment spilled on the decks will be contained and disposed of as IDW
4. Ongoing decontamination of the decks of the boats will continue throughout the day to keep the decks clean.

The following decontamination steps will be used to decontaminate sampling equipment that comes into contact with sample media. Decontamination of all items will follow the Field Branches Quality Management Plan (USEPA 2009) and SW-846 protocols. The decontamination procedure is as follows:

1. Residual sample media on equipment will be rinsed, scrubbed off, and collected according to the procedures outlined in SOP NC-15 – IDW Handling and Disposal.
2. Pre-wash rinse with tap water
3. Wash with solution of tap water and soap (brush)
4. Wash with ethyl acetate if residual oily sheen is present
5. Rinse with tap water

6. Rinse with DI water
7. Use immediately or cover all decontaminated items with aluminum foil

All used decontamination fluids will be collected and placed in labeled, designated containers suitable for disposal in accordance with IDW procedures outlined in SOP NC-15 – IDW Handling and Disposal.

Sensitive field instruments such as water quality meters will be rinsed daily during field operations at the end of each workday, or as needed, with DI water at a minimum, or more rigorously according to the manufacturer's instruction.

Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP. As described in the QAPP (Anchor QEA 2011b), equipment blanks will be collected periodically to validate the effectiveness of decontamination procedures.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

U.S. Environmental Protection Agency (USEPA), 2009. Field Branches Quality Management Plan. May 8, 2009.

USEPA SW-846. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

ATTACHMENT 1-NC-03

STANDARD OPERATING PROCEDURE CONDUCTIVITY, TEMPERATURE, DEPTH/TURBIDITY DATA COLLECTION AND WATER SAMPLING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection of water samples and physical water property data from a boat as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Specific information regarding water sample collection and the list of parameters for water quality analyses can be found in the Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for sampling water quality in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be summarized on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP; Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP; Anchor QEA 2011a, b, and c). Specialized training is not required for the operation of the multi-parameter instrumentation; however, field staff will be supervised by experienced staff prior to first use of the equipment.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP

- Decontamination equipment described in SOP NC-02 – Equipment Decontamination
- Bound, waterproof field log books
- Standardized field log forms (field forms)
- Black ballpoint pen or Sharpies (or equivalent)
- Multi-parameter instrument capable of in situ monitoring and profiling with internal data logging capabilities. The instrument must be capable of in situ sampling of depth, pH, dissolved oxygen, conductivity, temperature, salinity, and turbidity. The YSI Model 6820 V2 Sonde, outfitted with appropriate sensors to meet sampling needs, is suggested for this effort.
- Meter probe cable
- Boat, including the necessary navigational and communication equipment
- Weight bearing line/cable and anchor weight
- Tape measure or graduated cabling
- Plastic or duct tape
- Paper towels
- Deionized (DI) water
- Water sample containers per the FSAP and QAPP

Procedures

Prior to use in the field, the multi-parameter water quality meter will be calibrated following procedures outline in SOP NC-17 – Multi-parameter Water Quality Data Collection.

Sample Equipment Set-up

1. Fasten the measuring tape to the water quality meter sensor unit avoiding any obstructions to the sensors.
2. The water quality meter to a weighted deployment line so that the sensor unit remains approximately 1 foot above the anchor line weight.
3. Fasten the unit sensor cable and measuring tape to the weighted deployment line.
4. Immediately prior to sample collection, fasten the sampling tubing to a weighted tuna line. The tuna line will either be graduated for depth measurement, or a tape measure may also be attached.

Field Data and Sample Collection

1. Program the instrument to run in stand-alone mode (with all data being saved to the internal data logger) using the same sampling scheme run during instrument testing as described in the instrument manual. The instrument will be turned on before the first deployment.
2. Navigate the vessel to the target stations listed for water sampling in the FSAP using the navigational procedures outlined in the SOP NC-04 – Navigation and Boat Positioning.
3. Measure the total depth using a calibrated electronic depth finder.
4. Once the boat is secure on station, the instrument will be lowered into the water and profiling will begin. Profiles will be at discrete water depths at each sampling location, in accordance with the FSAP (Anchor QEA 2011c). Water quality measurements will be recorded at the water surface (approximate 6-inch depth) and at 1-foot intervals until approximately 1 foot above mudline.
5. The instrument must stay at each particular sampling depth for a total of 3 minutes in order for all of the instrument sensors to reach equilibrium and obtain an accurate result. Care should be taken to avoid any contact between the sensor and the creek floor.
6. A sampling form will be completed for each profile (SOP NC-11 – Water Column Profiling and Sample Collection). The following information will be recorded on the sampling form for each profile collected:
   - Instrument name, make, model, and serial number
   - List of sensors that are on the instrument
   - Names of field personnel involved in the sampling effort
   - Date and time profile collection begins and ends
   - Weather conditions and sea state
   - Depth of water at the location
   - Sample ID number for the co-located water quality profile sample
7. Once the sampling event is completed (all profiles collected), the instrument should be turned off and all data downloaded. The data file should be named with the instrument serial number and date of sampling.

Quality Assurance/Quality Control

Quality control procedures will consist of following standard instrument operation procedures for making in situ water quality measurements and following standard practices for the collection of water quality samples. Entries in the field forms will be double checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check/ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 1-NC-04

STANDARD OPERATING PROCEDURE NAVIGATION AND BOAT POSITIONING

Prepared by

Anchor QEA, LLC

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Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the methods to be used for positioning boats for the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek.

Procedures for navigation and boat positioning outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP; Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Boat navigation and positioning will only be performed by field team staff experienced with boat operations and differential global positioning system (DGPS) operation.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Daily float plan listing stations to be sampled, target station coordinates, access points along the Study Area, and sample transfer/transport locations
- Black, ballpoint pen or Sharpie markers (or equivalent)
- PPE as required by the HASP including personal floatation devices (PFDs) as required

- Sampling vessel equipped with necessary DGPS navigation and communication equipment
- DGPS Receivers
- Weighted tape measure for water depth measurements
- Boat spuds and/or an anchors system to stabilize boat on station
- Pre-determined sampling coordinates/waypoints and location figures

Horizontal Positioning Procedures

Horizontal positioning will be determined using a DGPS based on target coordinates listed in the FSAP. As described in FSAP, the sample locations may be modified based on field conditions. Measured geographic coordinates for station positions will be recorded and reported to the nearest 0.01. In addition, North American Datum (NAD 83) state plane coordinates will be reported to the nearest foot.

The following procedures describe the steps used to establish position at a location, as well as the steps to adjust the positioning for the collection of additional samples:

1. Sampling locations to be occupied will be selected by the Field Team Leader and communicated to the field team staff each day. Coordinates for each sampling location will be entered as a waypoint into the DGPS unit. The accuracy of each entry will be checked against the coordinates established in the FSAP.
2. The DGPS antennae will be maintained in a safe location that accurately represents the actual sample or measurement collection point (e.g., mounted to the top of the davit or A-frame used for raising or lowering the sampling equipment).
3. Using navigational data from the DGPS, the boat operator will navigate to and approach the actual sampling/measurement station.
4. For sediment sampling, the boat will be secured on station by lowering spud poles or anchors. Under some conditions, the boat may not be anchored based on safety as determined by the vessel operator.
5. For water column sampling, the boat will be positioned over each sampling/measurement location with no contact with the sediment/bottom. The operator will utilize the onboard navigation system to maintain positioning of the boat within 10 feet of the sampling/measurement location and may shore tie to

facilitate positioning. In some conditions, the boat may be anchored based on safety as determined by the vessel operator.

6. Once the boat is on location (and secured for sediment/macroinvertebrate sampling), the coordinates from the DGPS unit will be noted. With the boat on location, the coordinates will be stored electronically in the DGPS unit and recorded on the appropriate field form.
7. For repeated attempts at a sampling location, the boat will be moved within the radius of 200 or fewer feet parallel to the shoreline or 50 or fewer feet perpendicular to the shoreline surrounding the target coordinates. The boat will be repositioned by allowing it to rotate around the spud pole, by adjusting an anchor line, or motoring unattached until the new position for the sampling device has been established. The new position will be recorded on the appropriate field form.

Vertical Elevation Measurement Procedures

1. At each sampling station where elevation data is required, the water depth (from the top of the water level surface to the top of sediment surface) will be determined using a calibrated weighted line or tape measure.
2. The date and time of the measurement will be recorded on the appropriate data form.
3. Vertical elevation of each measurement station will be converted to mean lower low water (MLLW) elevation after each field sampling event.
4. Tidal elevations will be determined using measured data from the staff gauges and pressure transducers (Section 3.6).

Quality Assurance/Quality Control

DGPS system performance checks using built-in accuracy measurements and ground truths will be performed during the course of the sampling event to confirm DGPS accuracy. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 1-NC-05
STANDARD OPERATING PROCEDURE FOR SEDIMENT GRAB SAMPLING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: September 20, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection of surface sediment samples as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Surface sediment samples will be collected for two purposes: 1) to characterize the chemical nature of the surface sediments; and 2) to support the benthic macroinvertebrate community survey. Surface sediment samples will be collected using an Eckman sampler, modified Van Veen sampler, Petit Ponar sampler, box corer, sediment corer, or similar sampling device as appropriate for the type of sediment sample being collected. The sampling technique will be selected based on the field conditions to effectively obtain a 0- to 0.5-foot (0- to 15-cm) sample.

Procedures for surface sediment grab sampling outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). All field personnel are required to take a 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations training course and annual refresher courses, and participate in a medical monitoring program prior to grab sample collection activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

Sampling vessel equipped with DGPS
Grab sampler with doors and weights
Lines and pulleys
Tripping messengers
Marker buoy with weight and line
Siphon hose and/or turkey baster
Decontamination equipment
Stainless bowls and spoons for processing
DGPS and coordinates
Sampling and Analysis Plan (SAP) and HASP
Camera
White board and marker
Field notebook
Data logs
Sample jars
Sample labels
Coolers and ice
Temperature blank

Surface Sediment Grab Sample Collection

Sediment grabs are collected by lowering the grab device through the water column, either by hand or under winch control, and the grab penetrates the sediment by means of its weight. The operation of individual grab samplers is not described in this SOP because individual grab types require different tripping mechanisms in the collection of sediments. The following steps outline the general procedure for the collection of sediment samples regardless of the specific grab sampler used.

Surface sediment grab samples will be collected at locations designated in the Work Plan (AECOM 2011). Navigation and boat positioning procedures are described in SOP NC-04. Sediment collection will be performed using the following procedures:

1. Determine the appropriate equipment to be used for sediment collection requirements prior to field mobilization.
2. Maneuver the sampling vessel to the proposed sampling location (within 3 meters) using the navigation system. The vessel operator should hold the vessel on location if possible to allow for the sediment collection by "live boating." Alternatively, the vessel can be anchored or shore-tied to hold position over the sample location.
3. Prior to sampler deployment, discuss safety issues involved in sampler usage. Operators of grab equipment must be adequately familiar with grab and retrieval equipment usage prior to use. Practice grabs may be necessary for procedure familiarity.
4. Follow decontamination procedures of the grab sampler as outlined in SOP NC-02.
5. Ensure that deployment lines are free and clear and retrieval equipment is operational. Check that appropriate knots are prepared and that any mechanical retrieval equipment (davit and winch) are functioning properly.
6. Slowly lower the grab sampler to the sediment surface. Too rapid deployment can cause the sampler to sail off station or flip over. Deployment speeds can be adjusted according to various sediment types (i.e., soft sediments require a slower deployment to avoid over filling the grab device).
7. Once the sampler is on the bottom, give the grab sufficient slack to allow the tripping mechanism to release. In the case of the Ekman sampler, maintain sufficient tension for the tripping messenger to glide smoothly along the line to trip the sampler.
8. When live boating, maintain vertical control over the sampling position prior to lifting the sampler so that the grab can be lifted vertically off the bottom. Begin to lift the sampler, either by hand (Ekman) or using the davit and winch on the vessel. Lifting the grab off the bottom will allow the jaws to close.
9. Upon retrieval of the grab to the water surface, maintain ergonomic control when hand lifting the sampler into the vessel or lift the grab high enough to place it on a stable surface on the sampling vessel. When lifting onto the vessel, use care not to disturb the sample by banging it against the side of the vessel.

10. After the grab sampler is retrieved aboard and placed in a stable position, the sediment sample will be evaluated against Puget Sound Estuary Program (PSEP) sample acceptance protocols (PSEP 1997). PSEP acceptability criteria are generally listed in the FSAP and include the following:
    - Sampler is not overfilled (i.e., there is no sediment surface against the top doors of the sampler
    - Sediment surface is relatively flat, indicating minimal disturbance or winnowing
    - Overlying water is present, indicating minimal leakage
    - Overlying water has low turbidity, indicating minimal sample disturbance
    - Desired penetration depth is achieved
11. When sample criteria are deemed sufficient, use a siphon hose or turkey baster to remove overlying water in the sampler to expose the sediment surface. Take care to not disturb the sediment surface while siphoning and do not discard turbid water.
12. Follow the grab sample possessing and sample handling procedures outlined below.
13. Photograph the sediment surface in the grab, note the DGPS position, and follow the sample logging procedures outlined below.

Sample Processing

Sediment grab processing is typically conducted aboard the sampling vessel. It is important to place the grab on a stable surface and avoid disturbing the grab prior to surface water removal. All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil to minimize outside contamination between sampling events. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces. The steps for processing the samples are as follows:

1. Place the grab on a stable surface. Remove any overlying water using a syphon hose or turkey baster. Following grab acceptance criteria listed above, determine whether the grab is acceptable.
2. After noting their presence, remove any large objects or debris from the sediment surface.

3. If volatile organic compounds (VOCs) and total sulfides are to be sampled, this material is to be taken immediately upon opening the grab as described below in separate sections.
4. Prior to sampling, color photographs will be taken and a sediment description of each grab will be recorded on a standard grab processing log as described in SOP NC-01. Record the description of the grab sample on the grab log form for the following parameters as appropriate and present:
   - Sample recovery (depth in inches or centimeters of recovery in the grab sampler); this can be done using a ruler and measuring the depth of sediment in the grab at the center of the grab
   - Physical soil description of the grab in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, moisture, and color)
   - Odor (e.g., hydrogen sulfide, petroleum, etc.)
   - Vegetation
   - Debris
   - Biological activity (e.g., detritus, shells, tubes, bioturbation, or live or dead organisms)
   - Oil sheen
   - Any other distinguishing characteristics or features
5. Using a clean spoon, place sample material from the desired grab depth (0 to 15 cm) into a cleaned stainless steel bowl. To avoid cross contamination, take care to remove only sediment that has not come into contact with the sides or bottom of the grab. When sufficient material has been removed, the sample will be homogenized until a uniform color and consistency is achieved. The material will be homogenized using a stainless steel paddle and variable speed drill or by hand using a stainless steel spoon.
6. Using a clean, stainless steel spoon, completely fill pre-labeled sample containers indicated in the FSAP.
7. Immediately after filling the sample container with sediment, place the screw cap on the sample container and tighten.
8. Thoroughly check all sample containers for proper identification, analysis type, and lid tightness.

9. Pack each container carefully to prevent breakage and place inside of a cooler with ice for storage at the proper temperature (4° ± 2°C for all samples). Follow sample handling procedures in SOPs NC-13 and NC-14.

Subsampling – Volatile Organic Compounds

To minimize the loss of VOCs, the subsample for VOCs will be collected immediately upon grab retrieval (prior to sample characterization) and placed into a 2-oz glass container. To reduce potential outside contamination from working surfaces and loss of volatile compounds to be analyzed, this sample will be taken from a portion of the grab that has not been exposed to working surfaces. Only pre-cleaned stainless steel instruments will be used to collect sample material. Subsample material will be collected from representative portions along the entire depth of the sampling interval in the grab and transferred to the 2-oz glass container. Each glass container will be filled completely with sample sediment, allowing no headspace. Samples will be stored on ice in the dark at 4° ± 2°C.

Subsampling – Total Sulfides

1. Pre-cleaned stainless steel instruments will be used to collect sample material.
2. The total sulfides subsample will be collected from the same grab as sampled for VOC.
3. The sulfide sample will be collected immediately after the VOC sample is collected.
4. Exposure to air must be held to a minimum, and the sample should be kept moist to minimize oxidation.
5. A complete sample will require between 50 and 60 grams of material.
6. Subsample material will be collected along the entire depth of the representative sampling interval, transferred to a 120-mL glass container, fixed with 5 mL of 2N zinc acetate, capped, and shaken vigorously.
7. The sample label will clearly indicate the addition of zinc acetate preservative.
8. Samples will be stored on ice in the dark at 4° ± 2°C.

Sample Compositing Procedures

1. If sediment collected from more than one grab is to be combined into a single sample, a proportionate volume of each individual grab will be placed into a decontaminated stainless steel bowl for compositing.

2. For example, if a composite is made up of two grabs, the composite container will receive a 50 percent contribution from each individual sediment sample.
3. The material added to the composite container will be representative of the entire depth interval targeted for each individual sample.
4. As an individual contribution becomes available, its proportionate sediment volume will be added to the composite sample container.
5. When all of the desired material is placed into the compositing container, the material will be homogenized with a stainless steel paddle attached to a variable speed drill or by hand using a stainless steel spoon, until uniform in color and texture, then placed into the appropriate sample jars that are listed in the SAP.
6. The final composite volume must consist of sufficient sediment to fill all required sample jars.
7. The homogenate will be mixed throughout the process of filling sample jars to ensure that each sample jar is representative of the homogenate mixture.

Sample Logging Procedures

Sediment samples will be logged in the field to document all aspects of the sample so that database files can be generated. Information required on the data logs includes positional information, physical characteristics of the sediment, and other observations. The following data will be recorded on pre-printed data log forms printed on weather-proof paper:

- Project name
- Project number
- Sample identification (ID) see SOP NC-01, Field Record
- Date in YYMMDD format and time in XXXX format of sample collection
- Sampling personnel
- Weather observations
- Vessel name used for sampling
- Equipment used (i.e., van Veen or Ekman)
- DGPS positioning (i.e., Latitude, Longitude)
- DGPS datum used (i.e., NAD83, WA North Zone); see SOP NC-04, Navigation/Boat Positioning
- Water depth (from direct hand measurement or from vessel fathometer)

- Tide level (from Tides and Currents)
- Grab penetration/recovery
- Sample interval (i.e., 0 to 15 cm)
- Sample usage (i.e., chemical or benthic analysis)
- Analyses required
- A description of the sediment physical characteristics following American Society for Testing and Materials (ASTM) nomenclature; sediment descriptions consist of the following:
  - Sediment type (e.g., silt/clay, sand, gravel, etc.)
  - Major and minor constituents
  - Density/consistency (soil density and consistency are estimated based on visual observations and are presented in the field log)
  - Moisture (e.g., dry, damp, moist, or wet)
  - Sediment color (e.g., brown, gray, olive, black, etc.)
  - Sediment odor (i.e., H2S [none, trace, slight, moderate, strong], petroleum [none, trace, slight, moderate, strong])
  - Presence of sheen
  - Other sediment observations (i.e., percent of woody material on surface and within sample, biological activity, and presence of algae or debris)

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

PSEP (Puget Sound Estuary Program), 1997. Manual: Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound.

List of Attachments

Attachment 1 – Sediment Grab Collection Log

Surface Sediment Field Log

ANCHOR QEA

Job: Newtown Creek RI
Station:
Job No:
Date:
Field Staff:
Sample Method: Van Veen Grab
Contractor:
Proposed Coordinates: Lat.
Long.

Water Height
DTM Depth Sounder:
DTM Lead Line:

Tide Measurements
Time:
Height:

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Mudline Elevation (datum): calculated after sampling

Notes:

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		NAD 83 (N)	NAD 83 (E)			

Sample Description surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

Composite sample:

Sample Containers:

Analyses:

ANCHOR QEA

Newtown Creek Physical Description of Sediment Key

Visual Sediment Descriptions consist of the following:

Depth (recovered), USC symbol, moisture content, density/consistency (estimated based on visual observation), color, MAJOR CONSTITUENT/GROUP NAME. Amount and shape of minor constituents (e.g., wood, shells). Sheen and odor.

Recovered and In-situ depths

Recovered = measured in the lab, actual sediment depth from core tube
In situ = compaction-corrected

Sediment Description Terminology:

Moisture and Density:

Moisture Content	
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

Density/Consistency
Soil density and consistency are estimated based on visual observations

Density: Visual Core Drive Penetration		
SAND or GRAVEL		SILT or CLAY
Density	Visual	Consistency
Very loose	freefall	Very soft
Loose	easy penetration	Soft
Medium dense	moderate penetration	Medium stiff
Dense	hard penetration	Stiff
Very dense	refusal	Very stiff/Hard

Major and Minor Constituents by Volume:

Sediment	Percent
Trace (clay, silt, etc.)	0-5
Slightly (clayey, silty, etc.)	5-15
Clayey, silty, sandy, gravelly	15-30
Very (clayey, silty, etc.)	30-50
GROUP NAME	>50

Other Minor Constituents: % vol. (anthropogenics, etc.)	
Trace	0-5
Occasional	5-10
Moderate	10-30
Substantial	30-50

Sheen - % coverage	
None, trace	<2
Slight	2-15
Moderate	15-40
Moderate to Heavy	40-70
Heavy	>70

Sheen - Visual Description	
Rainbow	Multicolored
Metallic	Metallic gray-colored
Florets	Semi-circular and flat
Blebs	Semi-circular and spherical

Odor Descriptions
Trace
Slight
Moderate
Strong
HC-like = Hydrocarbon-like
H_2S = Hydrogen sulfide

*No odor or sheen observed unless noted

Structure and Other Sediment Descriptions	
Blocky	Cohesive soil that can be broken down into smaller lumps
Decomposed	Visible sign of decomposition or discoloration
Fresh	No visible sign of decomposition or discoloration
Gummy	Cohesive, pliable soil with high percentage of clay
Bed	Greater than 1/2" thick
Thin bed	Up to 1/2" thick
Laminated beds	Thin beds (<1/2" thick) lying between or alternating within a greater unit
Stratified beds	Beds (>1/2" thick) lying between or alternating within a greater unit
Layer	A bed or thin bed of anthropogenic material
Pockets	Semicircular to circular inclusion/deposit
Winnowed	Loss of material that occurred during coring
Anthropogenic	Debris originated from human activity

Contacts:	
@	Compositional change or presence of anthropogenic material
------------------	Major unit change/non-discrete, gradational contact
______________	Major unit change/visually discrete, abrupt contact

Core Acceptance Guidelines
1. Desired drive depth is reached or refusal.
2. Core recovery is greater than 70% or best professional judgment.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

NOTES:
*Classification of sediment on core logs is based on visual field and laboratory observations which include density/consistency, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification method ASTM D-2488 for the description and identification of soils was used as an identification guide.

ATTACHMENT 1-NC-06

STANDARD OPERATING PROCEDURE SUBSURFACE CORING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: September 20, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection of subsurface sediment core samples for the Remedial Investigation/Feasibility Study (RI/FS) for the Newtown Creek Study Area. Subsurface sediment samples for chemistry, geochronology, geotechnical, and archive testing will be collected by vibracore methods to achieve contact with the native (pre-navigation channel) soil unit or to a depth of approximately 20 feet (610 cm) below the mudline, whichever comes first. If necessary due to sample volume requirements, piston core or other direct-push method may be used to supplement sediment mass requirements in surface sediment intervals or to collect cores in areas that are not accessible using a boat capable of deploying a vibracore unit. Core processing and sample collection procedures are described in SOP NC-08 – Sediment Core Processing.

Procedures for subsurface sediment core collection sampling outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be summarized on the Daily Activity Log, and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). All field personnel are required to take a 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations training course and annual refresher courses, and participate in a medical monitoring program prior to engaging core collection activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Sampling vessel equipped with necessary differential global positioning system (DGPS) navigation and communication equipment
- Approved documents including FSAP, QAPP, and HASP
- Sample coordinates
- Vibracore sampling device
- Core tubes and caps
- Subsurface core collection field forms
- Duct tape
- Aluminum foil
- Decontamination materials
- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP
- Lead line
- Tape measure

Sampling Procedure Using a Vibracore

Subsurface sediment core samples will be collected at locations described in the FSAP (Anchor QEA 2011c). Navigation and boat positioning procedures are described in SOP NC-04 – Navigation and Boat Positioning. Prior to deployment, the following procedure will be used to decontaminate sample tubes:

1. Rinse and pre-clean with potable water
2. Wash and scrub the tubes in a solution of phosphate-free soap (e.g., Alconox®) and potable water
3. Rinse with potable water
4. Seal both ends of each core tube with a decontaminated core cap

The core cap will be removed immediately prior to placement into the coring device. Care will be taken during sampling to avoid contact of the sample tube with potentially contaminated surfaces.

Subsurface sediment core collection will be performed using the following procedures:

1. Vessel will maneuver to the proposed sample location (SOP NC-04 – Navigation and Boat Positioning)
2. A decontaminated core tube the length of the desired penetration depth will be secured to the vibratory assembly head and deployed from the vessel
3. The cable umbilical to the vibrator assembly will be drawn taut and perpendicular, as the core rests on the bottom sediment
4. The location will be recorded by the location control personnel, and depth to sediment will be measured with a survey tape attached to the head assembly and lead line
5. The core tube will be vibratory-driven into the sediment
6. A continuous core sample will be collected to the designated coring depth or until refusal
7. The depth of core penetration will be measured and recorded
8. The vibrator motor will be turned off and the core barrel will be extracted from the sediment using the winch
9. While suspended from the A-frame hoist, sediment adhered to the assembly head and outside of the core barrel will be sprayed off with site water and then placed on the vessel deck
10. The core sample will be evaluated at the visible ends of the core tube, the length of recovered sediment will be recorded, and, if accepted, the core tube will be sectioned into 4 to 6.5-foot lengths to facilitate delivery to the core processing location

Acceptance criteria for sediment core samples are as follows:

1. Overlying water is present and the surface is intact
2. The core tube appears intact without obstruction or blocking
3. Recovery is greater than 75 percent of drive length

If sample acceptance criteria are not achieved, the sample is rejected unless modified acceptance criteria are approved by the Field Team Leader and/or multiple attempts have been made at the sampling location.

Anchor QEA personnel will record field conditions and drive notes on a standard core log. Logs will include the following information:

1. The sample station identification
2. Elevation of each station sampled as measured from mean lower low water (MLLW)
3. Geographic position of the actual coring location as determined by DGPS.
4. Date and time of collection of each sediment core sample
5. Names of field personnel collecting and handling the samples
6. Observations made during sample collection, including weather conditions, complications, ship traffic, and other details associated with the sampling effort
7. Length of drive penetration and estimated recovery measurements
8. Qualitative notation of apparent resistance of sediment column to coring (how the core drove)

Once the core samples are deemed acceptable, the following procedures will be followed:

1. The cutterhead will be removed and a cap will be placed over the end of the tube and secured firmly in place with duct tape.
2. The core tube will then be removed from the sampler and the other end of the core will be capped and taped.
3. The core tube will be labeled with the sample station number, date of collection, and an arrow pointing to the top of core.
4. The cores will then be cut into appropriate lengths for transport to the core processing area for processing.
5. The cores will be sealed tightly enough to prevent leakage or disturbance during transport to the processing station.

Sampling Procedure Using a Piston Core/Direct Push

Subsurface sediment core samples will be collected by piston core/direct push where sample collection by vibracore methodology is not possible. Navigation and boat positioning procedures are described in SOP NC-04 – Navigation and Boat Positioning. Prior to deployment, the following procedure will be used to decontaminate sample tubes:

1. Rinse and pre-clean with potable water
2. Wash and scrub the tubes in a solution of phosphate-free soap (e.g., Alconox®) and potable water
3. Rinse with potable water
4. Seal both ends of each core tube with a decontaminated core cap

The core cap will be removed immediately prior to placement into the coring device. Care will be taken during sampling to avoid contact of the sample tube with potentially disturbed surfaces. Prior to deployment, the cable is passed through the core barrel and attached to a ring on the top of the piston which is then pushed up into the bottom end of the core barrel. The piston is pushed up into the core barrel so that a space is left at the bottom of the core barrel to accommodate a small layer of water (4 to 6 inches) between the sediment surface and the bottom surface of the piston.

Subsurface sediment core collection will be performed using the following procedures:

1. The vessel will maneuver to the proposed sample location (SOP NC-04 – Navigation and Boat Positioning)
2. A decontaminated core tube the length of the desired penetration depth will be assembled, checking to ensure that the core barrel is securely fastened to the piston core head.
3. Place the coring device on the sediment surface at the desired location using extension bars if necessary.
4. Secure the piston line. With the piston line secured, manually push the piston core vertically into the sediment. Record the depth of penetration by measuring movement of the piston top in relation to the sediment surface. Manually push the core into the sediment until refusal or the project depth has been achieved.

5. Excessive hammering to obtain deeper penetration should be avoided. Hammering in the piston core may prevent the manual retrieval of the core due to excessive sediment suction. If very soft sediments are encountered, soft hammering on the top of the core extension poles can be applied.
6. Exercise proper back care when pulling a stuck core out of the sediments. Alternatively, use an overhead winch to initiate sediment pull-out. Remove the extension bar as needed as the core is brought to the surface.
7. As the final extension bar is removed, maintain a vertical alignment with the core and place a cap over the bottom of the core as soon as the core nose clears the sediment or water surface to prevent sediment from sliding out the bottom of the core.
8. Remove the piston head and secure the core vertically for measurements. Allow any disturbed sediment to settle completely within the core tube and measure the recovered sediment length.
9. Water above the sediment must be drained prior to piston removal. First drain the water from above the piston by drilling a hole in the core barrel just above the piston. When the water is drained, drill another set of holes below the piston and just above the sediment surface. After all head water has been drained, the piston can be carefully drawn up and out of the top of the core barrel.
10. Cut off the excess plastic tube above the sediment surface and immediately cap the end and secure the caps on top and bottom with duct tape.
11. Evaluate the appearance and length of the core sample by examination through the clear plastic core liner. Note any stratigraphic intervals or other salient features on the core collection log sheet.
12. The core sample will be evaluated at the visible ends of the core tube, the length of recovered sediment will be recorded, and, if accepted, the core tube will be sectioned into 4 to 6.5-foot lengths to facilitate delivery to the core processing location

Acceptance criteria for sediment core samples are as follows:

1. Overlying water is present and the surface is intact
2. The core tube appears intact without obstruction or blocking
3. Recovery is greater than 75 percent of drive length

If sample acceptance criteria are not achieved, the sample will be rejected unless modified acceptance criteria are approved by the Field Team Leader.

Anchor QEA personnel will record field conditions and drive notes on a standard core log. Logs will include the following information:

1. The sample station identification
2. Elevation of each station sampled as measured from mean lower low water (MLLW)
3. Geographic position of the actual coring location as determined by DGPS.
4. Date and time of collection of each sediment core sample
5. Names of field personnel collecting and handling the samples
6. Observations made during sample collection, including weather conditions, complications, ship traffic, and other details associated with the sampling effort
7. Length of drive penetration and estimated recovery measurements
8. Qualitative notation of apparent resistance of sediment column to coring (how the core drove)

Once the core samples are deemed acceptable, a cap will be placed over the end of the tube and secured firmly in place with duct tape. The core tube will then be removed from the sampler and the other end of the core will be capped and taped. The core tube will be labeled with the sample station number, date of collection, and an arrow pointing to the top of the core. The cores will then be cut into appropriate lengths for transport to the core processing area for processing. The cores will be sealed tightly enough to prevent leakage or disturbance during transport to the processing station.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

List of Attachments

Attachment 1 – Sediment Core Collection Log

ATTACHMENT 1-NC-07

STANDARD OPERATING PROCEDURE CALIBRATION AND OPERATION OF A PORTABLE HYDROGEN SULFIDE MONITOR

Prepared by
Anchor QEA, LLC
305 W Grand Avenue, Suite 300
Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the procedure for using a portable hydrogen sulfide gas monitor during implementation of field tasks for the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. The meter will be used to monitor hydrogen sulfide levels in ambient air adjacent to surface sediment samples.

Procedures for equipment decontamination outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP; Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Specialized training is not required for decontamination of equipment; however, field staff will be supervised by experienced staff.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Hydrogen sulfide monitor
- Calibration tubes
- Model specific operations manual
- Battery charger
- Daily log for documentation of calibration, sample logs

Procedures

Start up and Calibration

Check out and ensure the proper operation of the H2S monitor as appropriate, using the equipment checklist provided below:

1. Allow the unit to calibrate to the surrounding temperatures (approx 5 min)
2. Follow the start-up procedure detailed in the operation manual
3. Set the monitor to calibration mode
4. Attach a regulator to a disposable cylinder of calibration gas
5. Follow the procedure detailed in the operation manual to calibrate the detector, if the meter reading is greater than + or – 15% of the responses value of the calibration gas used, the instrument should be red tagged and returned to the rental company for re-calibration

Operation

All readings are to be recorded on the surface sediment field forms. The following procedures pertain to the operation of the monitor:

1. Position the probe assembly close to the area to be monitored because the low sampling rate allows for only very localized readings. Under no circumstances should the probe tip come in contact with the sample.
2. Monitor the breathing zone of the work area as specified in the HASP.
3. When designated take readings of the sample when first collected and record any readings on the appropriate field form.
4. When the activity is completed carefully clean the outside of the monitor with a damp disposable towel to remove any visible dirt.
5. Turn the unit of as directed by the operation manual and recharge the battery.

Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP. As described in the QAPP (Anchor QEA 2011b), equipment blanks will be collected periodically to validate the effectiveness of decontamination procedures.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

U.S. Environmental Protection Agency (USEPA), 2009. Field Branches Quality Management Plan. May 8, 2009.

USEPA SW-846. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.

ATTACHMENT 1-NC-08

STANDARD OPERATING PROCEDURE
SEDIMENT CORE PROCESSING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: September 20, 2011

.

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the processing of subsurface sediment core samples to characterize the chemical nature of subsurface sediments as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Core collection is described in NC-06 – Core Collection. Specific information regarding subsurface sediment core processing can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for subsurface sediment core processing outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011c). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]. All field personnel are required to take a 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations training course and annual refresher courses, and participate in a medical monitoring program prior to engaging core processing activities. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP
- Decontamination equipment described in SOP NC-02
- Stainless steel bowls and spoons
- Subsurface sediment log forms
- Field note book
- Tape measure
- Camera
- White board and pens
- Paper towels
- Duct tape
- Aluminum foil
- Core cutting equipment
- Coolers with ice
- Sample containers and labels
- Plastic Ziploc bags (or equivalent)

Core Processing Procedure

1. Sediment cores, once collected, will be stored upright to preserve core sediment integrity and kept at 4° ± 2°C until processing.
2. Sediment core processing will be conducted at the processing area after being transported from the collection boat.
3. Core processing consists of removing the sediment from the core or cutting the core open to access the sediments.
4. All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with plastic or aluminum foil to minimize outside contamination between sampling events.

5. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.
6. Prior to processing, the core caps will be removed, and each section of the core will be cut longitudinally using a circular saw or with cutting snippers, taking care not to penetrate the sediment while cutting.
7. Make two longitudinal cuts along the sides of the core so that the core can be opened to expose the sediment.
8. The sediment core will be split with decontaminated stainless steel utensils to expose the center of the two halves for sampling.
9. If volatile organic compounds (VOCs) are to be sampled, this material is to be taken immediately upon opening the core, as described below, in separate sections.
10. Prior to sampling, color photographs will be taken of the total core length.
11. A description of the core sample will be recorded on the core log form for the following parameters as appropriate:
    - Date and time of sample collection
    - Sample recovery (depth in feet of penetration compared to recovery)
    - Physical soil description along the entire length of the core in accordance with ASTM procedures (ASTM D 2488 and ASTM D 2487 - United Soil Classification System) will be recorded including soil type, moisture content, density/consistency of soil, color, and visual evidence of impacts (e.g., hydrocarbon-like sheens)
    - Odors (e.g., hydrogen sulfide or petroleum)
    - Visual stratification, structure and texture
    - Vegetation and debris
    - Photoionization detector (PID) readings
    - Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
    - Presence of sheen
    - Any other distinguishing characteristics or features
12. Sample material will be removed from the core using decontaminated spoons or spatulas taking care not to remove material that has come into contact with the sides of the core tube.

13. Core intervals to be removed for chemical or geochonological analyses are described in the FSAP and will be determined based on recovered (not compaction corrected) measurements (Anchor QEA 2011c).

Subsampling - Volatile Organic Compounds

1. To minimize the loss of VOCs, subsamples for VOCs will be collected immediately upon core splitting prior to sample characterization.
2. Subsample VOC material will be collected from representative portions along the entire length of each sampling interval in the core and transferred directly into a 2-oz glass sample jar.
3. To reduce potential outside contamination from working surfaces and loss of volatile compounds to be analyzed, the VOC sample will be taken from a portion of the core that has not been exposed to working surfaces.
4. Only pre-cleaned stainless steel instruments will be used to collect sample material.
5. Each sample container will be filled completely with sediment, allowing minimal headspace. Samples will be stored on ice in the dark at 4° ± 2°C.

Sample Compositing Procedures

1. If sediment collected from several cores is to be combined into a single sample, a proportionate volume of each individual core section will be placed into a decontaminated stainless steel bowl for compositing.
2. For example, if a composite is made up of two samples, the composite container will receive a 50 percent contribution from each individual sediment sample.
3. The material added to the composite container will be representative of the entire depth interval targeted for each individual sample.
4. As an individual contribution becomes available, its proportionate sediment volume will be added to the composite sample container.
5. When all of the desired material is placed into the compositing container, the material will be homogenized until uniform in color and texture, then placed into the appropriate sample jars as described in the FSAP and QAPP (Anchor QEA 2011c and b).

6. The final composite volume must consist of sufficient sediment to fill all required sample jars.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

List of Attachments

Attachment 1 – Sediment Core Log Key

Attachment 2 – Sediment Core Processing Log

Newtown Creek Physical Description of Sediment Key

Visual Sediment Descriptions consist of the following:

Depth (recovered), USC symbol, moisture content, density/consistency (estimated based on visual observation), color, MAJOR CONSTITUENT/GROUP NAME. Amount and shape of minor constituents (e.g., wood, shells). Sheen and odor.

Recovered and In-situ depths

Recovered = measured in the lab, actual sediment depth from core tube

In situ = compaction-corrected

Sediment Description Terminology:

Moisture and Density:

Moisture Content	
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

Density/Consistency	
Soil density and consistency are estimated based on visual observations	

Density: Visual Core Drive Penetration		
SAND or GRAVEL		SILT or CLAY
Density	Visual	Consistency
Very loose	freefall	Very soft
Loose	easy penetration	Soft
Medium dense	moderate penetration	Medium stiff
Dense	hard penetration	Stiff
Very dense	refusal	Very stiff/Hard

Major and Minor Constituents by Volume:

Sediment	Percent
Trace (clay, silt, etc.)	0-5
Slightly (clayey, silty, etc.)	5-15
Clayey, silty, sandy, gravelly	15-30
Very (clayey, silty, etc.)	30-50
GROUP NAME	>50

Other Minor Constituents: % vol. (anthropogenics, etc.)	
Trace	0-5
Occasional	5-10
Moderate	10-30
Substantial	30-50

Sheen - % coverage	
None, trace	<2
Slight	2-15
Moderate	15-40
Moderate to Heavy	40-70
Heavy	>70

Sheen - Visual Description	
Rainbow	Multicolored
Metallic	Metallic gray-colored
Florets	Semi-circular and flat
Blebs	Semi-circular and spherical

Odor Descriptions
Trace
Slight
Moderate
Strong
HC-like = Hydrocarbon-like
H_2S = Hydrogen sulfide

*No odor or sheen observed unless noted

Structure and Other Sediment Descriptions	
Blocky	Cohesive soil that can be broken down into smaller lumps
Decomposed	Visible sign of decomposition or discoloration
Fresh	No visible sign of decomposition or discoloration
Gummy	Cohesive, pliable soil with high percentage of clay
Bed	Greater than 1/2" thick
Thin bed	Up to 1/2" thick
Laminated beds	Thin beds (<1/2" thick) lying between or alternating within a greater unit
Stratified beds	Beds (>1/2" thick) lying between or alternating within a greater unit
Layer	A bed or thin bed of anthropogenic material
Pockets	Semicircular to circular inclusion/deposit
Winnowed	Loss of material that occurred during coring
Anthropogenic	Debris originated from human activity

Contacts:	
@	Compositional change or presence of anthropogenic material
------------ (dashed line)	Major unit change/non-discrete, gradational contact
____________ (solid line)	Major unit change/visually discrete, abrupt contact

Core Acceptance Guidelines
1. Desired drive depth is reached or refusal.
2. Core recovery is greater than 70% or best professional judgment.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

NOTES:
*Classification of sediment on core logs is based on visual field and laboratory observations which include density/consistency, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification method ASTM D-2488 for the description and identification of soils was used as an identification guide.

Sediment Core Processing Log

ANCHOR QEA

Job: Newtown Creek RI	Station ID:
Job No.	Date/Time:
No. of Sections:	Core Logged By:
Drive Length:	Attempt #:
Recovery:	Type of Core ☐ Mudmole ☐ Vibracore ☐ Diver Core
% Recovery:	Diameter of Core (inches)
Notes:	Core Quality ☐ Good ☐ Fair ☐ Poor ☐ Disturbed

Recovered Length (cm)	Size % Gravel	Size % Sand	Size % Fines	**Classification and Remarks** (Density, Moisture, Color, Minor Constituent, MAJOR Constituent, with Additional Constituents, Sheen, Odor)	Recovered Length (cm)	PID	Sample	Summary Sketch

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ATTACHMENT 1-NC-09

STANDARD OPERATING PROCEDURE GEOCHRONOLOGY CORE PROCESSING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011.

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the processing of subsurface sediment core samples specifically for sediment geochronology measurements as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Vibracore sediment collection is described in NC-06 – Core Collection Using a Vibracore. Geochronological cores will be used to evaluate long-term stability and sedimentation rates, which are determined using radioisotope abundances of Cesium-137 (^{137}Cs) and Lead-210 (^{210}Pb). Specific information regarding geochronology core processing can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011a) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for subsurface sediment core sampling outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). All field personnel are required to take a 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations training course and annual refresher courses, and participate in a medical monitoring program prior to processing geochronology cores. Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP
- Decontamination equipment described in SOP NC-02
- Stainless steel bowls and spoons
- Subsurface sediment log forms
- Field note book
- Tape measure
- Camera
- White board and pens
- Paper towels
- Duct tape
- Aluminum foil
- Core cutting equipment
- Coolers with ice
- Sample containers and labels
- Plastic Ziploc bags (or equivalent)

Core Processing Procedure

1. Sediment cores, once collected, will be stored upright to preserve core sediment integrity and kept at 4° ± 2°C until processing.
2. Sediment core processing will be conducted at the processing area after being transported from the collection boat.
3. Core processing consists of removing the sediment from the core or cutting the core open to access the sediments.
4. All working surfaces and instruments will be thoroughly cleaned, decontaminated, and covered with aluminum foil or plastic sheeting to minimize outside contamination between sampling events.

5. Disposable gloves will be discarded after processing each station and replaced prior to handling decontaminated instruments or work surfaces.
6. Prior to processing, the core caps will be removed, and each section of the core will be cut longitudinally using a circular saw or with cutting snippers, taking care not to penetrate the sediment while cutting.
7. Make two longitudinal cuts along the sides of the core so that the core can be opened to expose the sediment.
8. Prior to sectioning the core, color photographs will be taken of the total core length.
9. A description of the core sample will be recorded on the core log form for the following parameters as appropriate:
   - Date and time of sample collection
   - Sample recovery (depth in feet of penetration compared to recovery)
   - Physical soil description along the entire length of the core in accordance with ASTM procedures (ASTM D 2488 and ASTM D 2487 - United Soil Classification System) will be recorded including soil type, moisture content, density/consistency of soil, color, and visual evidence of impacts (e.g., hydrocarbon-like sheens)
   - Odors (e.g., hydrogen sulfide or petroleum)
   - Visual stratification, structure and texture
   - Vegetation and debris
   - Photoionization detector (PID) readings
   - Biological activity (e.g., detritus, shells, tubes, bioturbation, or live or dead organisms)
   - Presence of sheen
   - Any other distinguishing characteristics or features
10. To improve the resolution for the radioisotope analyses, relatively thin sections of sediment cores will be extracted (i.e., generally 0.07-foot [2-cm] segments) using clean spatulas to minimize contamination.
11. Sample material will be removed from the core using decontaminated spoons or spatulas, taking care not to remove material that has come into contact with the sides of the core tube.

12. Each 2-cm section will then be placed into the sample container directly without homogenization.
13. Sediment core intervals that are 0.07 foot (2 cm) thick will be collected throughout the length of the core.
14. A representative number of sample intervals will be selected for analysis based on sediment type and estimated sediment rates.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

List of Attachments

Attachment 1 – Sediment Core Log Key
Attachment 2 – Sediment Core Processing Log

Newtown Creek Physical Description of Sediment Key

Visual Sediment Descriptions consist of the following:

Depth (recovered), USC symbol, moisture content, density/consistency (estimated based on visual observation), color, MAJOR CONSTITUENT/GROUP NAME. Amount and shape of minor constituents (e.g., wood, shells). Sheen and odor.

Recovered and In-situ depths

Recovered = measured in the lab, actual sediment depth from core tube

In situ = compaction-corrected

Sediment Description Terminology:

Moisture and Density:

Moisture Content	
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content, no visible water
Wet	Visible free water, probably above optimum

Density/Consistency	
Soil density and consistency are estimated based on visual observations	

Density: Visual Core Drive Penetration		
SAND or GRAVEL		SILT or CLAY
Density	Visual	Consistency
Very loose	freefall	Very soft
Loose	easy penetration	Soft
Medium dense	moderate penetration	Medium stiff
Dense	hard penetration	Stiff
Very dense	refusal	Very stiff/Hard

Major and Minor Constituents by Volume:

Sediment	Percent
Trace (clay, silt, etc.)	0-5
Slightly (clayey, silty, etc.)	5-15
Clayey, silty, sandy, gravelly	15-30
Very (clayey, silty, etc.)	30-50
GROUP NAME	>50

Other Minor Constituents: % vol. (anthropogenics, etc.)	
Trace	0-5
Occasional	5-10
Moderate	10-30
Substantial	30-50

Sheen - % coverage	
None, trace	<2
Slight	2-15
Moderate	15-40
Moderate to Heavy	40-70
Heavy	>70

Sheen - Visual Description	
Rainbow	Multicolored
Metallic	Metallic gray-colored
Florets	Semi-circular and flat
Blebs	Semi-circular and spherical

Odor Descriptions
Trace
Slight
Moderate
Strong
HC-like = Hydrocarbon-like
H_2S = Hydrogen sulfide

*No odor or sheen observed unless noted

Structure and Other Sediment Descriptions	
Blocky	Cohesive soil that can be broken down into smaller lumps
Decomposed	Visible sign of decomposition or discoloration
Fresh	No visible sign of decomposition or discoloration
Gummy	Cohesive, pliable soil with high percentage of clay
Bed	Greater than 1/2" thick
Thin bed	Up to 1/2" thick
Laminated beds	Thin beds (<1/2" thick) lying between or alternating within a greater unit
Stratified beds	Beds (>1/2" thick) lying between or alternating within a greater unit
Layer	A bed or thin bed of anthropogenic material
Pockets	Semicircular to circular inclusion/deposit
Winnowed	Loss of material that occurred during coring
Anthropogenic	Debris originated from human activity

Contacts:	
@	Compositional change or presence of anthropogenic material
------------	Major unit change/non-discrete, gradational contact
________	Major unit change/visually discrete, abrupt contact

Core Acceptance Guidelines
1. Desired drive depth is reached or refusal.
2. Core recovery is greater than 70% or best professional judgment.
3. Core tube appears intact (no signs of blocking, bending).
4. Minimal sediment loss out the top or bottom (minimal winnowing).

NOTES:
*Classification of sediment on core logs is based on visual field and laboratory observations which include density/consistency, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification method ASTM D-2488 for the description and identification of soils was used as an identification guide.

Sediment Core Processing Log

Job: Newtown Creek RI	Station ID:
Job No.	Date/Time:
No. of Sections:	Core Logged By:
Drive Length:	Attempt #:
Recovery:	Type of Core ☐ Mudmole ☐ Vibracore ☐ Diver Core
% Recovery:	Diameter of Core (inches)
Notes:	Core Quality ☐ Good ☐ Fair ☐ Poor ☐ Disturbed

Recovered Length (cm)	Size % Gravel	Size % Sand	Size % Fines	**Classification and Remarks** (Density, Moisture, Color, Minor Constituent, MAJOR Constituent, with Additional Constituents, Sheen, Odor)	Recovered Length (cm)	PID	Sample	Summary Sketch

ATTACHMENT 1-NC-10

STANDARD OPERATING PROCEDURE
SEDFLUME TESTING

SEDFlume

Standard Operating Procedure
SOP NC-10

Prepared by:

Sea Engineering, Inc.
200 Washington Street, Suite 210
Santa Cruz, CA 95060

Tel: (831) 421-0871
Fax: (831) 421-0875

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SEDFlume Standard Operating Procedure

1. Introduction

Sea Engineering, Inc. (SEI) will conduct SEDFlume sampling to determine sediment erosion rates laterally and with depth at five locations shown on Figure 9-1 in the FSAP. Each of the five SEDFlume cores will be collected up to 1 meter in length and will be taken for the analysis of erosion rates. The direct measurement of sediment erosion rates via SEDFlume provides a quantitative measurement of sediment stability that can be used to determine the potential for sediment mobility in a natural system (McNeil et al., 1996). It has, additionally, been demonstrated that erosion rates are strongly dependent on the bulk density of the sediments (Jepsen et. al, 1997; Roberts et. al, 1978) and particle grain sizes. Because of this, the densities and particle size distributions of distinct layers of sediment from the SEDFlume cores will be determined by sub-sampling select depth intervals periodically. Site-wide, cores will be spatially located so as to best spatially depict the different types of sediments present.

Examples of sample SEDFlume data results from a recent study in San Francisco Bay, California, are shown below. Figure 1 shows variation of sediment erosion rates with depth into the sediments and varying shear stresses. It can be seen in this plot that the surficial sediments erode easily at lower sediments, but at lower (deeper) levels in the core the sediments become more difficult to erode, requiring larger shear stresses to mobilize sediments. Figure 2 shows particle size and bulk density variation measured from the same core.

The ultimate objective of a SEDFlume study is to characterize the erosion rates and sediment stability of sediments throughout the region of interest. Sediment characteristics such as mean particle size, particle size distribution, and wet bulk density (moisture content) will be determined at select depth intervals for each core obtained. This information will provide parameters that can be directly included in a sediment/contaminant transport model to estimate re-suspension of sediment.

The end product of a SEDFlume study yields a detailed data report that will contain images of each core prior to analysis, tables of measured data and illustrations of data trends within each core. Plots of erosion rates versus core depth for various shear stresses will be included as well as plots of bulk parameters (density and median particle size) versus core depth. General trends in the data set will be noted and variations between different regions will be characterized, if possible. All quality assurance objectives will be achieved during core collection, analysis and reporting.

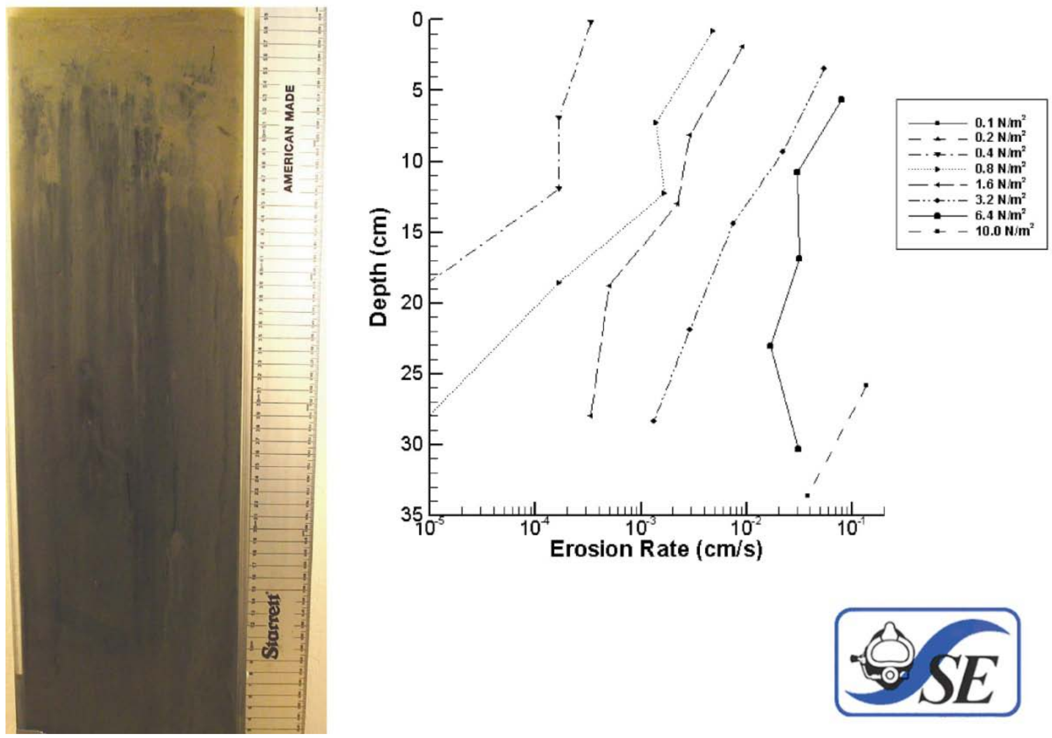

Figure 1. Pre-processing core image (left) and erosion rate variation with depth and varying shear stresses for a site in San Francisco Bay (right). The vertical scale of each image is identical.

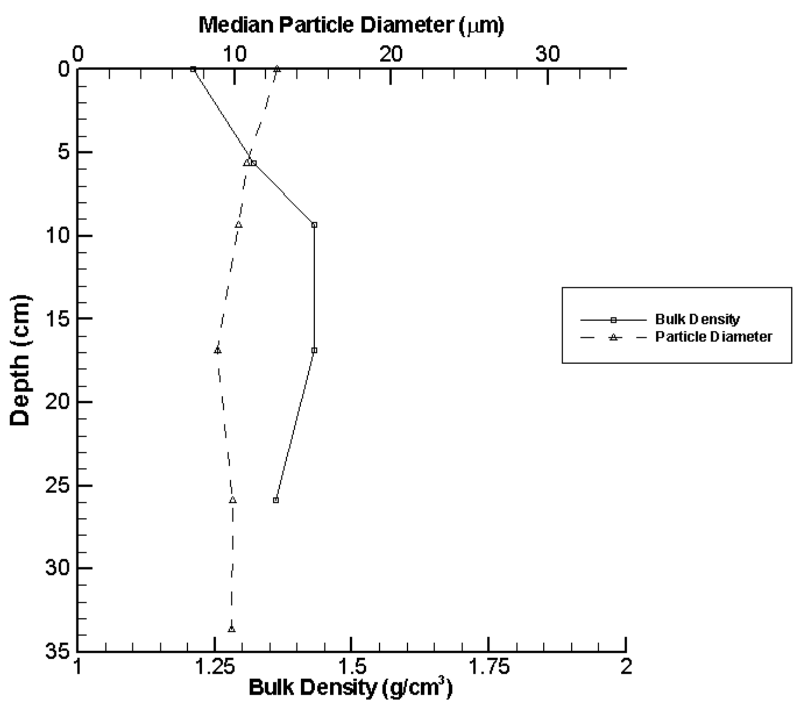

Figure 2. Variation of particle size and bulk density with depth for the same San Francisco Bay location as shown above.

The following procedure describes the processes, procedures and results of the SEDFlume analysis. Core dimensions are 10 cm x 15 cm rectangular cross-sections and core lengths are up to 1 meter. Variations on the size and shapes of cores collected and analyzed are possible, through the use of adapters to fit to the existing SEDFlume equipment.

All of these analyses are achievable through the procedures described below. For simplicity, the procedures solely describe the traditional SEDFlume collection and analaysis methods.

2. Core Collection Procedures

The following procedures describe, in detail, the process for preparing to, and collecting, cores for SEDFlume analysis. Cores with 10 cm x 15 cm cross-sections are described because that is the typical core cross-section analyzed; however, SEDFlume has been designed to incorporate other cross-sections and shapes through the use of adapters. If field conditions require a different core size and shape, SEI engineers will use the appropriate adapter in coordination with EPA.

Equipment Preparation

Figures 3 and 4 depict the equipment and setup necessary to conduct SEDFlume coring. Pictured in Fugure 3 are the basic required materials to prepare each time a core is being collected. Future equipment developments may lead to the use of different equipment than that which is pictured here; however, the procedures will remain equivalent:

1. Coring Cap – Affixes to the top of the Core Barrel and provides required suction to prevent loss of sediment from within core barrel.

2. Core Barrel – The core barrel houses the core once collected

3. Piston- The piston is inserted at the base of the core barrel after collection and is required during the analysis.

4. Core Lids – 2 lids (top and bottom) to secure and protect the core material during transport.

*Additional miscellaneous materials (such as Duct tape, towels, and cleanser) should also be on hand. All seals on lids and the O-ring around the piston should be liberally coated with the included vacuum grease. This ensures a snug fit and good seal. It is recommended that latex gloves are used in the handing and application of the vacuum grease.

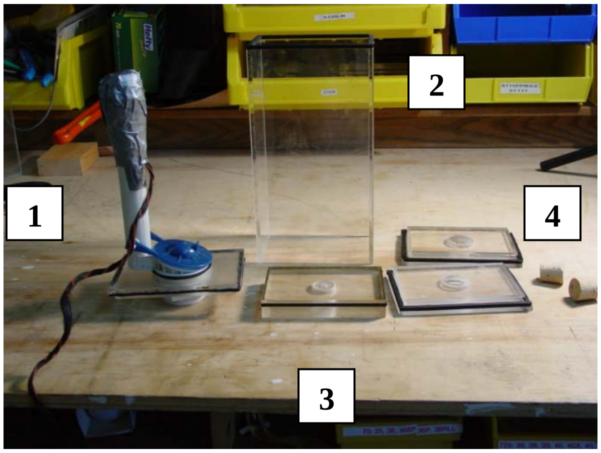

Figure 3. Basic SEDFlume equipment required for each collected core.

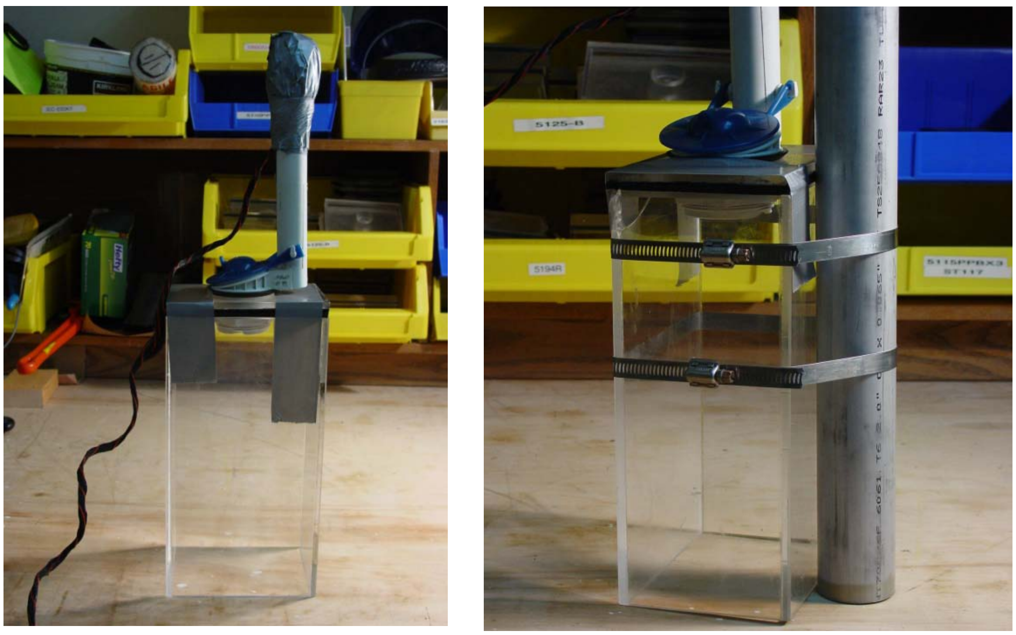

Figure 4. Two images of the core barrel and final setup prior to coring. The core barrel and vacuum flap lid prepared (left); the core barrel attached to the coring pole (right).

The coring vacuum cap should be securely fixed to the top of the core (the side with the black foam striping) with duct tape (Figure 4). The pole used for coring can then be affixed with the two pipe clamps included as shown above. The pipe clamps should be tightened, but <u>care should be taken not to over tighten or the core box will break</u>. No play should be allowed between the core box and the coring pole. Once fastened, additional 8' lengths of pole may be affixed with included collars to increase pole length, allowing coring up to maximum depths of 25-30'.

Coring

The safety line attached to the coring cap should be secured so the cap is not lost if the core becomes stuck in the sediment on the seabed. The core can then be lowered into the water on the pole. The following bullets identify the proper coring procedure.

- Core should be lowered in a perpendicular position smoothly and slowly until the core reaches the sediment surface. Extreme care should be taken to avoid surface sediment disturbance.
- Push the core firmly and evenly into the sediments approximately 2-3 feet (depends upon the length of the core barrel being used). The poles can be marked with a marker near the waterline so this distance is known.
- It is important not to over-penetrate the core (push too far in) because that results in surface sediment disturbance. If that occurs, the sediments must be re-cored. This ensures that potential very soft "fluffy" surface sediment is included in the core sample.
- Slowly pull the pole upwards to pull core from sediments. Resistance may be significant, so use slow and steady pressure (two people may be required). Do not rock core back and forth to release. Pull straight up.
- Pull core to the surface leaving the core just underwater and verify that the proper amount of sediment has been collected, and that, at least, 3-4 inches of clearance is present between the sediment surface and the top of the core. Record water appearance and ensure very soft surface sediment has been retained in the core sample.
- Before pulling the core completely out of the water, reach into the water and insert a piston into the core barrel. The indention side of the piston must face down (indention can be readily identified on each piston). Figure 5 below shows the piston inserted with indention facing down. Use two people, one to hold pole and core and the other to insert piston.

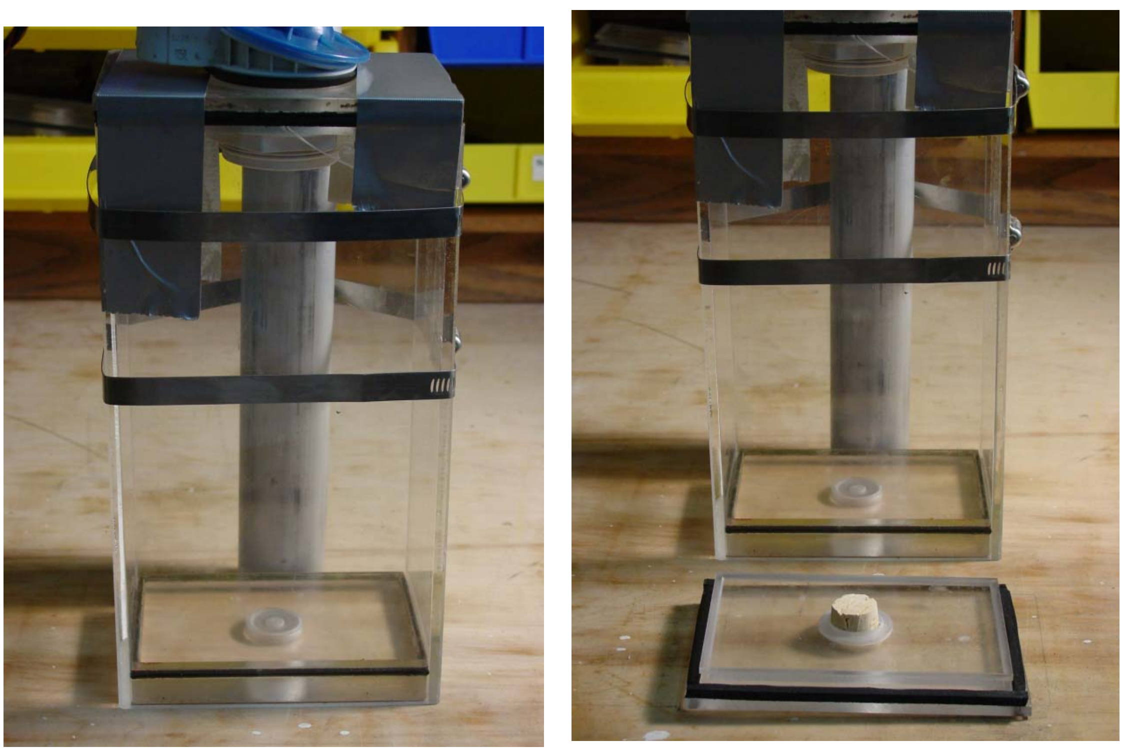

Figure 5. Two images of the equipment as they should appear after core collection (These images do not show the sediment material for clarity). The piston inserted with indention side down (left); The piston inserted and bottom lid prepared to be inserted beneath the piston (right).

- At this point, the core can now safely be brought out of the water while a person holds the piston in to ensure sediments are not lost through the bottom of the core barrel.

- A lid with a cork can then be affixed to the bottom on board the boat.

- The outside of the core box can then be cleaned and the pole and coring cap detached. The core should be again inspected to verify that it is intact with adequate space (at least 3-4 inches) at the top of the core.

- The core can then be cleaned and dried so that the lid on the bottom can be secured with duct tape. And additional lid should be attached to the top and also affixed with duct tape (Figure 6).

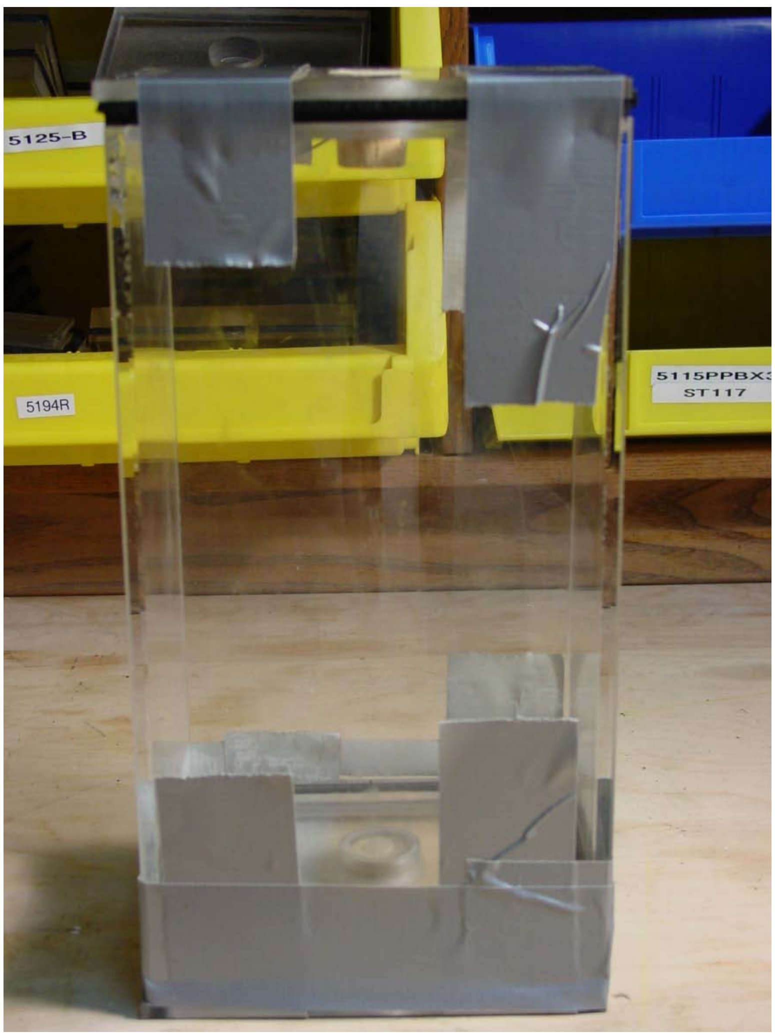

Figure 6. Image of core after core collection (not showing sediment in core) showing proper taping locations to secure core for handling and transport.

- The core should be liberally sealed with duct tape.
- The core is secure and can now be handled and transported.

Identification of the test method

The purpose of the above-described testing method is to properly collect sediment cores from job locations for SEDFlume analysis.

Safety

Prior to core collection deployment, all personnel are required to review the site-specific health and safety plan (HASP) and understand the health and safety issues associated with Sedflume sampling. Coring normally takes place from a vessel of opportunity. Available vessels may be small and unstable, or large and difficult to hold in position, each creating their own unique hazards. Therefore, safety while coring is very important. Personal flotation devices are to be worn while coring on boats along with appropriate level 'D' safety equipment. Personnel are to wear appropriate contamination-prevention protection (e.g. gloves, Tyveks) when handling contaminated sediments. Employees that will be exposed to contaminated sediments will have completed their 40-hr HAZWOPER (or 8-hr refresher) course prior to entering the site.

The proper choice of attire will enhance the effectiveness of safety equipment in the event of an accident. Bare feet or any form of open-topped shoes are not acceptable laboratory attire.

Equipment and supplies

Equipment, materials and supplies that are necessary to complete analytical testing are provided by Sea Engineering, Inc. The purchase of materials, equipment and supplies which impact data quality is to be accomplished in such a way that a preset of defined quality and/or performance specifications is included as part of the bid package.

Equipment that has been subjected to overloading, mishandling or otherwise thought to be defective is taken out of service until the appropriate measures/repairs are completed and the instrument has been tested and calibrated to perform satisfactorily. Preventive maintenance procedures are to be prepared for each new piece of equipment acquired. This includes checking the calibration of each piece of equipment before each daily use. There are four logbooks, one for each piece of equipment. Before each daily use the analyst must log that they have calibrated the equipment.

Sample collection, preservation, storage, handling and chain of custody

Samples will be collected, handled, and analyzed by SEI personnel. Chain of custody will be recorded as required by project specifications. Cores will either be processed on-site or collected and shipped back to the SEI laboratory in Santa Cruz, CA. Dr. Craig Jones of SEI will supervise all SEDFlume operations. Holding time before analysis of cores is 28 days unless otherwise discussed between SEI employees and the client. The SEDFlume Chain of Custody Sampling Datasheet is filled out for each core that is taken. This form, and all forms relevant to SEDFlume projects, is included in Appendix A of this SOP. All forms are also photocopied and placed in the Sample Receipt Logbook.

Record keeping and record storage (archives)

The SEDFlume Chain of Custody Sampling Datasheet is filled out for each core that is taken. These forms are photocopied and placed in the Sample Receipt Logbook for archiving.

Inventory procedures

Employees that notice supplies running low in the lab are responsible to order more supplies. A general supply check takes place before any analysis begins to make sure that SEI has the supplies needed.

Pollution Prevention/Waste Management/Management of laboratory wastes and hazardous materials

When dealing with contaminated sediments great care is taken to prevent spillage. If some spillage occurs it is cleaned up immediately using the proper cleaning agents. All contaminated sediments and water are dumped into large water containers kept on-site at the laboratory. These containers are emptied by a designated pollution/waste company when the job is completed and/or when the containers are full.

Non-contaminated liquid and sediment waste materials are simply washed down the sink. Non-contaminated solid wastes are thrown into designated trash bins and emptied when full.

Corrective Action

Whenever an out of control situation has been detected, the analyst should notify his supervisor and together try to resolve the problem which caused the situation. After resolution, the analyst should continue with the corrective action to bring the analysis back in control. Usually this means re-preparing and/or reanalyzing the samples. For every situation that requires a corrective action, the analyst will fill out a corrective action form found in the Quality Assurance Manual. Once the corrective action has been put in place and the form has been signed and filed the corrective action must be monitored for its effectiveness.

Correcting Erroneous Reports

The client will immediately be notified of any errors in our reports. They will receive a detailed description of the error with the appropriate correction.

Complaint Resolution

Anytime a serious complaint is received, it is recorded for a permanent record, tracked to insure resolution, and brought to the attention of senior managers. A serious complaint is one that questions the validity of our results. In general, the nature of the complaint is documented on a form which is given to the Vice President/Technical Director or Laboratory Manager. Someone is assigned to resolve the issues and monitor for its effectiveness. The progress of the complaint resolution is discussed and tracked during weekly staff meetings. Finally, after resolution, the client is contacted for final comments, and the complaint form is signed off by a second senior manager. A permanent record is kept by the Quality Assurance Manager. A Client Complaint Record or similar form will be used to record the complaint which can be found in the Quality Assurance Manual.

3. Analytical Procedures

A detailed description of SEDFlume and its application are given in McNeil et al (1996) and Roberts et al (1998). The following section provides a general description of the SEDFlume analysis conducted for this study.

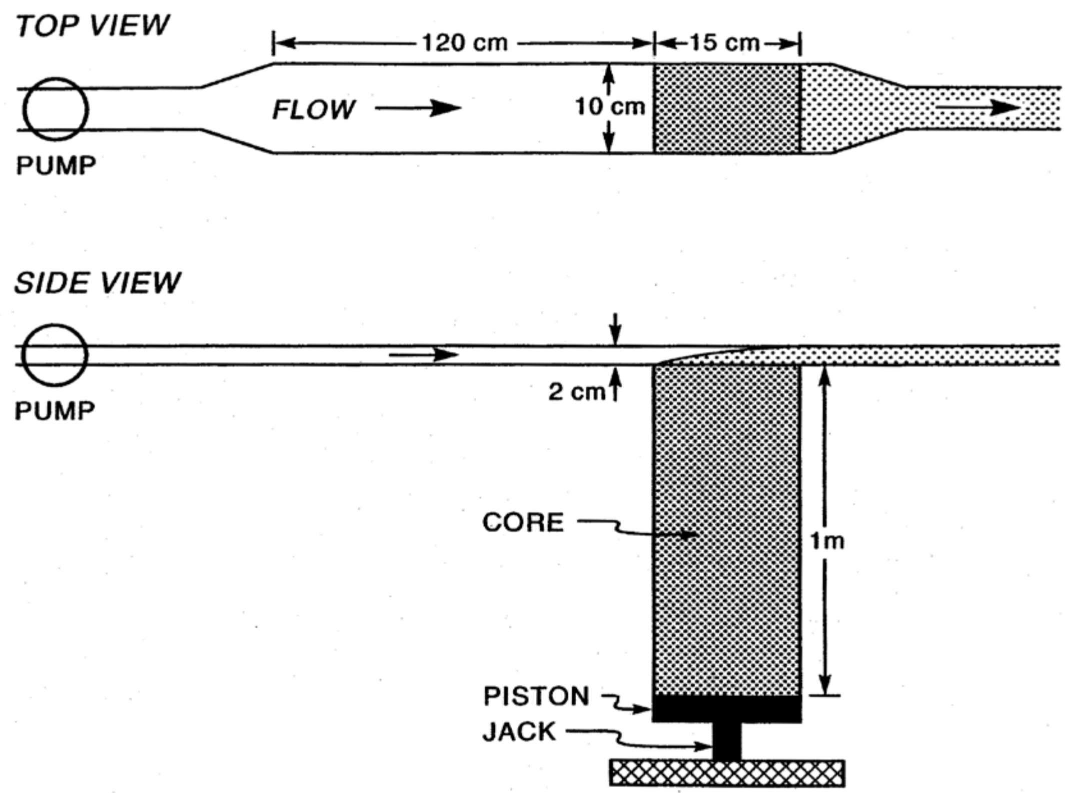

Figure 7. SEDFlume Diagram

Description of SEDFlume

A SEDFlume diagram is shown in Figure 7. It is essentially a straight flume that has a test section with an open bottom through which a rectangular cross-section core containing sediment can be inserted. The main components of the flume are the core; the test section; an inlet section for uniform, fully-developed, turbulent flow; a flow exit section; a water storage tank; and a pump to force water through the system. The coring tube, test section, inlet section, and exit section are made of clear acrylic so that the sediment-water interactions can be observed. The coring barrel has a rectangular cross-section, 10 cm by 15 cm, and can be up to 1 m in length.

Local, potable freshwater is pumped through the system from a 300 gallon storage tank, through a 5 cm diameter pipe, and then through a flow converter into the rectangular duct shown. This duct is 2 cm in height, 10 cm in width, and 120 cm in length; it connects to the test section, which has the same cross-sectional area and is 15 cm long. The flow converter changes the shape of the cross-section from circular to the rectangular duct shape while maintaining a constant cross-sectional area. A ball valve regulates the flow so that the flow into the duct can be carefully controlled. Also, there is a small valve in the duct immediately downstream from the test section that is opened at higher flow rates to keep the pressure in the duct and over the test section at atmospheric conditions.

At the start of each test, the core and the sediment it contains are readied and inserted into the bottom of the test section. An operator moves the sediment upward using a piston that is inside the core and is connected to a hydraulic jack with a 1 meter drive stroke. The jack is driven by the release of pressure that is regulated with a switch and valve system. By this means, the sediments can be raised and made level with the bottom of the test section. The speed of the hydraulic jack movement can be controlled at a variable rate in measurable increments as small as 0.5 mm.

Water is forced through the duct and the test section over the surface of the sediments. The shear produced by this flow causes the sediments to erode. As the sediments in the core erode, the core sediments are continually moved upward by the operator so that the sediment-water interface remains level with the bottom of the test and inlet sections. The erosion rate is recorded as the upward movement of the sediments in the coring tube over time.

Measurements of Sediment Erosion Rates

The sediment cores are inserted into the SEDFlume test section using the hydraulic jack until the sediment surface is even with the bottom of the SEDFlume channel. A detailed description of the sediment surface will be recorded and photographed to evaluate potential variability and useable of the data in relation to in-situ conditions at the time of modeling. A measurement is made of the core length. The flume is then run at a specific flow rate corresponding to a particular shear stress (McNeil et al., 1996). Erosion rates are obtained by measuring the core length at different time intervals, taking the difference between each successive measurement, and dividing by the time interval as shown in Equation 1:

$$E = \frac{\Delta z}{T} \tag{1}$$

E = Erosion rate
Δz = Amount of sediment eroded
T = Time

In order to measure erosion rates at several different shear stresses using only one core, the following procedure is used:

- Starting at a low shear stress, the flume is run sequentially at higher shear stresses with each succeeding shear stress being twice the previous one. Generally, a flow rate is applied until 10 minutes has expired or 1-2 cm of sediment has eroded.
- The shear stress cycle is halted if the next increase in shear stress would erode more than 1-2 cm in 20 seconds (for most analyses, measurements less than 20 seconds in duration are not considered to hold a high degree of accuracy).
- The time interval is recorded for each run with a stopwatch.
- Applied shear stresses include: 1, 2, 4, 8, 16, 32, 64 & 128 Pa, doubling the shear stress with each increase.

This cycle is repeated until all at least 25-30 cm is eroded from the core (more material can be eroded as specified by the client). If, after two cycles, a particular shear stress shows a rate of erosion less than 10^{-4} cm/s (i.e. zero erosion occurring at that shear stress), it is dropped from the cycle; higher shear stresses are then added as appropriate. During the analysis, if the composition of the material changes at a sediment interface resulting in an observable change of erosion properties, the cycle is stopped and a new cycle started at the lowest shear stress.

Determination of Critical Shear Stress

The critical shear stress of a sediment bed, τ_{cr}, is defined quantitatively as the shear stress at which a very small, but accurately measurable, rate of erosion occurs. For SEDFlume studies, this rate of erosion has been practically defined as 10^{-4} cm/s. This represents 1 mm of erosion in approximately 15 minutes. Since it is difficult to measure τ_{cr} exactly at 10^{-4} cm/s, erosion rates were determined above and below 10^{-4} cm/s. The τ_{cr} was then determined by two interpolation techniques, linear and power law regression.

Measurement of Sediment Bulk Properties

In addition to erosion rate measurements, samples are collected at periodic intervals to determine the water content, bulk density, and particle size distribution of the sediments. Sub-samples are collected from the undisturbed sediment surface as well as the sediment surface at the end of each shear stress cycle. This allows a sample to be collected approximately every 5 cm for analysis.

Bulk density was determined in the SEI mobile SEDFlume laboratory by water content analysis using methods outlined in Hakanson and Jansson (2002). This consisted of determining the wet and dry weight of the collected sample to determine the water content, W, from Equation 2.

$$W = \frac{M_w - M_d}{M_w} \qquad (2)$$

W = water content
M_w = wet weight of sample
M_d = dry weight of sample

Once the water content was calculated, the bulk density, ρ_b, was determined from Equation 3.

$$\rho_b = \frac{\rho_w \rho_s}{\rho_w + (\rho_s - \rho_w)W} \qquad (3)$$

ρ_w = density of water (1 g/cm^3)
ρ_s = density of sediment particle (2.65 g/cm^3)

Particle size distributions are determined using laser diffraction analysis in the SEI Santa Cruz, CA laboratory. Samples are prepared and inserted into a Beckman Coulter LS 13 320. Each sample is analyzed in three 1-minute intervals and the results of the three analyses are averaged. This method is valid for particle sizes between 0.04 and 2000 µm. Any fraction over 2000 µm is weighed and compared to total sample weight to determine the weight percentage greater than 2000 µm. Table 1 summarizes all measurements conducted during SEDFlume analyses.

Table 1. Parameters measured and computed during the SEDFlume analysis.

Measurement	Definition	Units	Detection Limit

Bulk Density, ρ_b (wet/dry weight)	$\rho_b = \dfrac{\rho_w \rho_s}{\rho_w + (\rho_s - \rho_w)W}$	g/cm^3	Same as water content
Water Content	$W = \dfrac{M_w - M_d}{M_w}$	unit less	0.1g in sample weight ranging from 10 to 50 g
Particle Size Distribution	Distribution of particle sizes by volume percentage using laser diffraction	μm	0.04 μm – 2000 μm
Erosion Rate	E = Δz/T	cm/s	Δz > 0.5mm T > 15s
Critical Shear Stress τ_{cr}	Shear stress when erosion rate equals 10^{-4} cm/s	N/m^2	0 to 10.0 N/m^2 This value is interpolated as described in the text.

W = water content
M_w = wet weight of sample
M_d = dry weight of sample
Δz = amount of sediment eroded
T = time
ρ_w = density of water (1 g/cm^3)
ρ_s = density of sediment (2.65 g/cm^3)

Erosion Rate Comparisons

A useful method of analyzing sediment characteristics at a specific site is to compare the inter-core and intra-core SEDFlume erosion rates. This method provides a means to quantify the erosion susceptibility within each core as well as the general erosion susceptibility of the coring site. In this analysis, each core has been sub-sampled into approximately five separate depth intervals (shear cycles). Following the methods of Roberts et al (1998), the erosion rate for each interval can be approximated by

$$E = A\tau^n \rho^m \tag{4}$$

where E is the erosion rate (cm/s), τ is the shear stress (N/m^2) and ρ is the sediment bulk density (g/cm^3). A, n and m are constants that depend on the sediment characteristics. The equation used in this analysis is an abbreviated variation of Equation 4:

$$E = A\tau^n \tag{5}$$

where the sediment bulk density parameter is a function of the constant A. The variation of erosion rate with density cannot be typically determined in the field due to natural variation in other sediment properties (e.g. mineralogy and particle size). Therefore, the density term for a particular interval of approximately constant density is lumped into the constant A. For each depth interval, the measured SEDFlume erosion rates (E) and applied shear stresses (τ) were used to determine the A and n constants that provide a best fit power law curve to the data for that interval. With good fits (i.e. $r^2 > 0.75$), these parameters can be used to predict erosion rates for the core interval of interest. Correlation thresholds used for acceptability criteria are typically larger than, or equal to, 0.75.

From this process a depth-averaged erosion rate for a particular core can also be determined, and the erosion rate at each depth interval can be directly compared to this depth-average. The result is an erosion rate *ratio* which provides an estimation of the erosion susceptibility of each depth interval relative to the core average. This procedure highlights the depths of the core that will erode more rapidly, and those that will tend to resist erosion, relative to the other intervals in the core. Intervals for which the r^2 is less than the correlation threshold or containing less than three data points are omitted from this comparison and will show up as blank intervals in the following bar plots.

In addition, a site-wide erosion rate average can be estimated that incorporates the interval data from all sampled cores. The erosion rate for each depth interval within a core is compared to the site-wide average and a graph of the erosion rate ratios for all of the cores is created. Again, the procedure highlights the cores and depth intervals at which the most rapid erosion would be expected (relative to the other core locations), and a spatial assessment of erosion probability can be generated.

Two interpolation techniques are used to determine values of critical shear stress: a power law interpolation and a linear interpolation. For the former, a power law curve is created (in the form of Equation 5) by solving for the variables A and n by maximizing the correlation (r^2) to the measured data points. A solution for the critical shear stress can then be computed from Equation 5 by inserting an erosion rate of 10^{-4} cm/s. For the latter, a simple linear interpolation solves for the critical shear stress at an erosion rate of 10^{-4} cm/s based on the measured SEDFlume data.

4. Data Validation and Usability

Data Quality Objectives for Measurement Data

To achieve the project's overall data quality objectives, measurements will be made to ensure sufficient characterization of sediment bulk properties and erosion rates. The bulk properties to be measured by SEI have been chosen based on previously determined field and laboratory work (McNeil et al, 1996; Taylor et al, 1996; Jepsen et al, 1997; and Roberts et al, 1998), and are listed in Table 1 (above). Additional procedures to verify data quality are listed below, if applicable.

Data Review, Validation and Verification Requirements

This section describes the statistical assessment procedures that are applied to the data and the general assessment of the data quality accomplishments. This is only performed on replicate cores.

Precision

The precision will be evaluated by performing duplicate analyses and will be assessed by the following three methods:

1) Difference

Difference = $X_1 - X_2$

Where: X_1 = larger of the two observed values
X_2 = smaller of the two observed values

2) Relative Percent Difference (RPD)

$$\text{RPD} = \frac{(X_1 - X_2) * 100}{(X_1 - X_2)/2}$$

3) Relative Standard Deviation (RSD)

RSD = $(s/\bar{y})*100$

Where: s = standard deviation
$\bar{y}$ = mean replicate analyses

This formula is used for three or more replicate values and may be used when reporting precision on aggregated data.

Standard deviation is defined as follows:

$$s = \sqrt{\sum_{n=1}^{n} \frac{(y_i - \bar{y})^2}{(n-1)}}$$

Where: y_i = measured value of the ith replicate

$\bar{y}$ = mean of replicate analyses
n = number of replicates

Accuracy

Accuracy will be based upon known samples or reference. Field and laboratory blank samples can also be used in the assessment of accuracy. Accuracy will be evaluated by determining whether the samples are within the required acceptance windows. Bias for a particular sample is defined as:

$$Bias = \frac{\sum (Y_{ik} - R_i)}{n}$$

Where: Y_{ik} = the average observed value for the ith audit sample and k observations
R_i = the theoretical reference value
n = the number of reference samples used in the assessment

Comparability

Comparability will be assessed through the evaluation of precision and accuracy estimates of samples. Replicates of at least four samples will be taken from each of four sites to demonstrate comparability.

Detectability

An important factor to consider in data quality evaluations is the detection limit, which is defined as the lowest value of a characteristic that a measurement process or a method-specific procedure can reliably discern. Detection limits can be defined, in general, as:

$$\text{Detection Limit} = t_{(n-1,1-\alpha=.99)} * s$$

Where: $t_{(n-1,1-\alpha=.99)}$ = researcher's t-value for a one sided 99% confidence level and standard deviation estimate with n-1 degrees of freedom.
s = standard deviation

SEDFlume field data is not amenable to statistical analysis. Erosion rates vary both laterally and with depth, and, thus, no two measurements should be necessarily similar. Note that erosion rates can vary by as much as five orders of magnitude for a given core. The same applies to bulk density and to grain size. In each case there is no theoretically achievable value and as such, accuracy is an unsuitable criterion. Precision is a proper criterion only when evaluating replicates and split duplicates. Split duplicates may be obtained for bulk parameters; however, split duplicates are not possible for erosion rates. Table 1 (above) summarizes other acceptance criteria for the proposed measurements as relating to detection limits and internal consistency.

Completeness will be assessed for each variable upon completion of the measurements. There is ample time in the field for obtaining a second core from a given site if there are identified concerns with the initial core.

Data that is determined to be inaccurate, incomplete, or non-detectable will either be rejected or presented with clear notification of data deficiency.

References

Jepsen, R., J. McNeil, and W. Lick, 1999. Effects of Gas Generation on the Density and Erosion of Sediments from the Grand River, Report, Department of Mechanical and Environmental Engineering, University of California, Santa Barbara, CA 93106.

Jepsen, R., J. Roberts, and W. Lick, 1997, Effects of Bulk Density on Sediment Erosion Rates, Water, Air, and Soil Pollution,Vol. 99, pp. 21-31.

McNeil, J., C. Taylor, and W. Lick, 1996, Measurements of Erosion of Undisturbed Bottom Sediments with Depth, J. Hydraulic Engineering, 122(6) pp. 316-324.

Roberts, J., R. Jepsen, and W. Lick, 1998, Effects of Particle Size and Bulk Density on the Erosion of Quartz Particles, J. Hydraulic Engineering, 124(12) pp. 1261-1267.

Taylor, C. and W. Lick, 1996, Erosion Properties of Great Lakes Sediments, UCSB Report.

Appendix A – Sample Data Sheets

Chain of Custody

Sea Engineering, Inc.
200 Washington St., Suite 210
Santa Cruz, CA 95062
CHAIN OF CUSTODY FORM

Project Name:	Job Number:
Client Organization:	SEI Project Manager:
Address to Send Results:	SEI Field Manager:
Client E-mail for Sending Data:	Client Contact / Project Manager:
Client Tel for Follow-up:	Client Sampler / Recorder:

Core Designation	COLLECTION				SAMPLING SITE	TEST NAME
	DATE	TIME	AM	PM		

Chain of Custody Record			
Relinquished by:	Date/Time:	Received by:	Date/Time:
Received for analysis by:	Date/Time:	SEI Sedflume Tel: 831-421-0871 Fax: 831-421-0875	Please fax Chain of Custody form to SEI prior to delivery.

Balance Log Sheet

Item of equipment: Balance
Manufacturer's name: Ohaus Precision Standard Electronic Balance
Type identification: TS 200S
Serial number: SWB35717944
Date received: June 2003
Date placed in service: June 2003
Condition of equipment when placed in service: Used
Current location: on a table to the right of the door, nest to the drying oven
Location of manufacturer's instruction manual: in Balance Logbook
Log of daily (or before each use) functional/calibration checks with certified weights: Balance Log Sheets

Balance Log Sheets

Date	Time	Analyst	Calibrated Weights (50g)	Calibrated Weights (1g)	Notes

Balance Log Sheets Version # 1.1
1/13/09

Page #____

Drying Oven Log Sheet

Item of equipment: Drying Oven
Manufacturer's name: Quality Lab Inc.
Type identification: Model 30GC Lab Oven
Serial number: G32293
Date received: June 2003
Date placed in service: June 2003
Condition of equipment when placed in service (new, used or reconditioned): Used
Current location: on a table to the right of the door
Location of manufacturer's instruction manual: in Oven Logbook
Log of daily (or before each use) functional/calibration checks with certified thermometer: Oven Log Sheets
Thermometer serial #: 1249

Oven Log Sheets

Date	Time	Analyst	Temperature	Serial # of thermometer	Notes

Oven Log Sheets Version # 1
4/2/08

Page #_____

SEDFlume Calibration Sheet

Item of equipment: **SEDFLUME**
Manufacturer's name: N/A
Type identification: N/A
Serial number: N/A
Date received: June 2003
Date placed in service: June 2003
Condition of equipment when placed in service: constructed in our lab
Current location: in the main room of the lab
Location of instruction manual: in Sedflume Logbook
Log of daily (or before each use) functional/calibration checks: Sedflume Log sheets

Sedflume Log Sheets

Date	Time	Analyst	Flow Rate (gpm)	Volume (g)/Time (sec)	Calculated flow rate (gpm)	Notes
4/23/2010	0840	Magalen	5.1	5gal/58sec	5.17gpm	
12/9/2010	0600	Magalen	5.3	5gal/59sec	5.09gpm	
12/9/2010	10:30	Magalen	5.4	5gal/59sec	5.09gpm	
12/9/10	14:15	Magalen	5.3	5gal/[illegible]sec	5.26gpm	
12/10/10	0620	Magalen	5.1	5gal/59sec	5.09gpm	
12/10/10	10:30	Magalen	5.0	5gal/61sec	4.92gpm	
12/10/10	14:30	Magalen	5.0	5gal/60sec	5gpm	
12/11/10	0630	Magalen	5.2	5gal/58sec	5.2gpm	
12/11/10	1100	Magalen	5.1	5gal/59sec	5.09gpm	
12/11/10	1445	Magalen	5.1	5gal/59sec	5.09gpm	
12/12/10	730	Magalen	4.9	5gal/61sec	4.92gpm	
5/21/11	0900	Magalen	5.1	5gal/60sec	5gpm	
5/22/11	0830	Magalen	5.1	5gal/60sec	5gpm	
5/23/11	0745	Magalen	4.9	5gal/61sec	4.92gpm	
5/24/11	0730	Magalen	5.3	5gal/57sec	5.26gpm	

Sedflume Log Sheets Version 1
4/2/08
2

Core Collection Log Sheet

SEDFLUME SAMPLING DATA SHEET

Sea Engineering, Inc.
Project Number: **Project Title:**

DATE (mm/dd/yy) ________ INITIALS ________ AREA-STATION ID ________

ON STATION (time) ________ WATER DEPTH ________ Ft M Fm

STATION POSITION (NAD 83) Latitude or Northing ________ Longitude or Easting ________

SAMPLER USED (circle one) Vibracorer Gravity Corer Push Corer (size ______) Van Veen Grab Other:

Sampling Area	Sample Type	Minimum Acceptable Recovery
	Sedflume*	30 cm (1 ft)
* Core must have undisturbed surface and no visible fractures in core.		

Attempt Number					
Attempt Start/End Time	/	/	/	/	/
Apparent Penetration Depth (ft or cm)					
Recovery (ft or cm)					
Accepted (yes/no)					
Rejection Code					

Rejection Codes

OP	Overpenetrated	DB	Debris interference	NS	No sediment in sampler
NR	Insufficient Recovery	DS	Disturbed surface	FR	Core has visible fracture in sediments

For Acceptable Sample: Visible color change near surface? No Yes at ______cm Photographed ? No Yes	Attach Unique Sample ID here

Comments ________

Reviewed by ________ Date ________

Erosion Rate Measurement Datasheet

SEDFLUME LABORATORY DATASHEET

Sample Designation:

Date/Time:

Core Height: cm

Reference Height for the top of the core: cm

Reference Contact:

Photo:

Location:

Project:

Item Number	Shear Stress (dynes/cm^2)	Starting Height (mm)	Ending Height (mm)	Time (sec)	NOTES

4/2/08 Sedflume Laboratory Datasheet Version 1

Page___of___

Bulk Parameters Datasheet

Bulk Density Datasheet

Sample Designation:

Date/Time:

Core Height: cm

Reference Contact:

Photo:

Location:

Project:

Bulk Density Sample

Sample ID	Depth	Tray Weight (g)	Wet Wt. (g)	Dry Wt. (g) 1 Date and Time	% water content	Dry Wt. (g) 2 Date and Time	% water content	Dry Wt. (g) 3 Date and Time	% water content	Bulk Density (g/cm3)

Particle Size Sample

Tray Weight (g)	Dry Weight (g)	Beaker Weight (g)	Dry + Beaker (g)

4/2/08 SOP Sediment Grain Size Analysis
Bulk Density Datasheet Version 1

Page___of___

ATTACHMENT 1-NC-11

STANDARD OPERATING PROCEDURE WATER COLUMN PROFILING AND SAMPLING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: October 19, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the procedures for the collection of water samples and physical water property data from a boat as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Water column profiling data will be collected using a multi-parameter water quality meter to obtain physical water property data as described in SOP NC-17 – Multi-Parameter Water Quality Data Collection. Specific information regarding water sample collection and the list of parameters for water quality analyses can be found in the Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for water column profiling and sampling in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be summarized on the Daily Activity Log and recorded on a Field Change Report (see NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Specialized training is not required for the operation of the multi-parameter instrumentation; however, field staff will be supervised by experienced staff prior to first use of the equipment.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP

- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP
- Decontamination equipment described in SOP NC-02 – Equipment Decontamination
- Bound, waterproof field log books
- Standardized field log forms (Field forms)
- Black ballpoint pen or Sharpies (or equivalent)
- Multi-parameter water quality meter and manufacturers operating manual
- Meter probe cable Hand held data logger
- Boat, including the necessary navigational and communication equipment
- Peristaltic pump
- Kemmerer bottle sampler
- Tubing necessary for sample collection
- Silicone flexible tubing and compatible polymer tubing
- Weight bearing line/cable and anchor weight
- Tape measure or graduated cabling
- Plastic or duct tape
- Paper towels
- Deionized (DI) water
- Water sample containers per the FSAP and QAPP
- Filters for dissolved metals analysis

Procedures

Prior to use in the field, the multi-parameter water quality meter will be calibrated following procedures outline in SOP NC-17 – Multi-parameter Water Quality Data Collection.
Surface water samples for all analyses (excluding VOCs) will be collected using a peristaltic pump with the sample tubing attached to a weighted line. Surface water samples for VOCs will be collected using a Kemmerer bottle at the same water depth as the samples collected by peristaltic pump. Water samples will be collected at discrete intervals from the bottom up to the surface as the line is retrieved. Water samples will be collected using USEPA's "clean hands" procedures to minimize contamination (USEPA 1996). The procedures below describe collection of surface water samples using a peristaltic pump/tubing and Kemmerer bottle.

Efforts will be made not to disturb the bottom sediment while water sampling or conducting the water column profiling. Surface water samples will not be collected within 24 hours of collection of sediment samples on Newtown Creek to ensure that sediment disturbed during sediment collection activities do not result in false positive results in water column samples

Sample Equipment Set-up

1. Fasten the measuring tape to the water quality meter sensor unit avoiding any obstructions to the sensors.
2. The water quality meter to a weighted deployment line so that the sensor unit remains approximately 1 foot above the anchor line weight.
3. Fasten the unit sensor cable and measuring tape to the weighted deployment line.
4. Fasten a tape measure to the Kemmerer bottle line.
5. Immediately prior to sample collection, fasten the sampling tubing to a weighted tuna line. The tuna line will either be graduated for depth measurement, or a tape measure may also be attached.

1.1 Field Data and Sample Collection

1. During water sample collection, no disturbance of sediment due to the concern that sediments could become entrained in a water sample and result in false positive results. If it is suspected that either instrumentation or weights have disturbed the sediment, other locations will be sampled.
2. Navigate the vessel to the target stations listed for water sampling in the FSAP using the navigational procedures outlined in the SOP NC-04 – Navigation and Boat Positioning. Whenever possible, samples are collected facing upstream and upwind to minimize introduction of contamination.
3. Measure the total depth using a calibrated electronic depth finder.
4. Deploy the water quality meter and begin data profiling.
5. Slowly lower the instrument through the water column, and record water column profile data at specified intervals (outlined in the FSAP) until the instrument is approximately 3 feet above the bottom (as measured). Record water quality data on the water quality data log during sample collection (Attachment 1).

6. Based on water depth and water column profile data, as described in the FSAP, evaluate the water column structure to determine the depths for water sample collection as described below.
    a. For analytical surface water samples: one surface water sample will be collected just below the water surface (approximately 1 meter [3.28 feet] below the water surface). One deeper sample will be collected at approximately 0.6 meters (2 feet) above the mudline except in areas where significant slopes and/or contact with the sediments is a significant concern in which case the sample will be collected at 1 meter (3.28 feet) above the mudline.
    b. For ecological surface water samples: one deeper sample will be collected at approximately 0.6 meters (2 feet) above the mudline except in areas where significant slopes and/or contact with the sediments is a significant concern in which case the sample will be collected at 1 meter (3.28 feet) above the mudline.
    c. For current meter surface water samples: one surface water sample will be collected just below the water surface (approximately 1 meter [3.28 feet] below the water surface, one sample will be taken at mid-depth, and one deeper sample will be collected at approximately 0.6 meters (2 feet) above the mudline except in areas where significant slopes and/or contact with the sediments is a significant concern in which case the sample will be collected at 1 meter (3.28 feet) above the mudline.
7. Record sample collection data on the Surface Water Collection Form (Attachment 2).
8. For peristaltic pump/tubing sampling:
    a. Lower the tubing to the deepest required sample depth.
    b. Flush the sample tubing with at least one system volume
    c. Collect water directly from the pump outlet tubing into the required sample bottles.
    d. Maintain clean hands/dirty hands procedures with regards to bottle and tubing handling.
    e. Attach a new 0.45 μm capsule filter for collection of samples for dissolved metals.

   f. If multiple depths will be sampled, raise the tubing to the next depth and repeat the procedure starting with step b above.
   g. Once sampling is complete at each station, discard and replace all dedicated sampling equipment (i.e., tubing and filters).
9. For Kemmerer sampling (VOCs only):
   a. Lower the sampler (Kemmerer in the open position) to the required sample depth.
   b. Raise/lower the Kemmerer bottle three times in the open position at the sample depth.
   c. Release the steel messenger to close the sampler and isolate the water sample.
   d. Bring the sampler to the surface and immediately transfer the water sample to the appropriate sample containers.
10. Fill sample containers using USEPA's "clean hands" procedures to minimize contamination (USEPA 1996).
11. Place all collected water samples directly into pre-labeled, laboratory-supplied bottlesand stored on ice as described in SOP NC-13 – Sample Custody and SOP NC-14 – Sample Packaging and Shipping.
12. Decontaminate the Kemmerer bottle as described in SOP NC-02 – Equipment Decontamination.

Quality Assurance/Quality Control

Quality control procedures will consist of following standard instrument operation procedures for making in situ water quality measurements and following standard practices for the collection of water quality samples. Entries in the field forms will be double checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check/ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

USEPA, 1996. Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels. U.S. Environmental Protection Agency Office of Water Engineering and Analysis Division (4303) 401 M Street S.W. Washington, D.C. 20460. July 1996.

List of Attachments

Attachment 1 – Water Profiling and Sampling Log
Attachment 2 – Surface Water Collection Form
Attachment 3 – Opportunistic Sample Record

Water Profiling and Sampling Log

Project: Newtown Creek RI	Station:
Project No:	Date:
Field Staff:	
Instrument Make/Model:	Insrument Serial No:
Sensor Make/Model:	Sensor Serial No:
Sensor Make/Model:	Sensor Serial No:
Sensor Make/Model:	Sensor Serial No:
Sensor Make/Model:	Sensor Serial No:
Sensor Make/Model:	Sensor Serial No:
Lat. (WGS 84):	Long. (WGS 84):
Weather Conditions:	
Water Depth - lead line (m):	Sampling Technique: Kemmerer bottle
Time:	Sonde

Profile #/Sample ID	Start Time	End Time	Depth (m)	Vertical Sampling Interval (m)	Analyses

Notes:

ANCHOR QEA

305 W Grand Avenue, Suite 300
Montvale, New Jersey 07645
Phone 201.930.9890
Fax 201.930.9805
www.anchorqea.com

Surface Water Collection Form

Station ID:		**Date:**	**Time:**
Project Name: Newtown Creek		**Project Number:**	
Coordinates (Datum**:** WGS 84**)**			
Lat/Northing		Long/Easting	
Depth of Sample (LLW):			
Weather Observations:			
Field Parameters			
Temperature	°C	Turbidity	NTU
pH		DO	mg/L
TSS Collected	Y / N		
Evidence of floating or suspended materials:		Y / N	Description:
Evidence of oil/hydrocarbon sheen:		Y / N	Description:
Discoloration and Turbidity:			
	Color:		
	Source:		
	Area:		
	Plume:	Y / N	
Odor	none, slight, moderate, strong H_2S, petroleum, septic		
Volume collected:			

Comments:
TSS samples taken to lab: Date:__________ Time: ____________

Recorded by:

ANCHOR QEA

305 W Grand Avenue, Suite 300
Montvale, New Jersey 07645
Phone 201.930.9890
Fax 201. 930.9805
www.anchorqea.com

Opportunistic Sample Record

Station ID:		**Date:**	**Time:**
Project Name: Newtown Creek RI		**Project Number:**	
Coordinates Datum**:** WGS 84			
Lat/Northing		Long/Easting	
Depth of Sample (LLW):			
Weather Observations:			
Field Parameters			
Temperature	°C	Turbidity	NTU
pH		DO	mg/L
Salinity	ppm	Conductivity	µS/cm
Description of Sampling Location (e.g., pipe, seep, overland flow):			
Odor	none, slight, moderate, strong H_2S, petroleum, septic		
Volume collected:			
Comments: TSS samples taken to lab: Date:__________ Time: ____________			
Recorded by:			

ATTACHMENT 1-NC-12

STANDARD OPERATING PROCEDURE CURRENT METER DEPLOYMENT AND DATA COLLECTION

Pending – To be submitted at a later date, after the selection of the subcontractor responsible for the activity.

ATTACHMENT 1-NC-13

STANDARD OPERATING PROCEDURE SAMPLE CUSTODY

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: August 2, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) addresses the sampling program requirements for maintaining custody of samples throughout the sample collection and shipping process as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. The objective of chain-of-custody (COC) procedures is to provide sufficient evidence of sample integrity to satisfy data defensibility requirements.

Procedures for sample custody outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted as part of the Newtown Creek RI/FS by Anchor QEA personnel.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Specialized training is not required for COC procedures; however, field staff will be supervised by experienced staff when first performing COC procedures.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Bound, waterproof field logbooks
- Black ballpoint pen or Sharpies (or equivalent)

- Custody tape or seals
- Sample labels
- COC forms on waterproof paper
- Bags for COCs
- Clear plastic sealing tape

Chain-of-Custody Procedures

As few people as possible should handle the samples. Each sample generated in the field will be assigned a unique identification (refer to FSAP for the sample identification protocol; Anchor QEA 2011c). A label will be attached to each bottle used for sampling. Labels will be applied to the container, not the lid, whenever possible. The lid will also be labeled with the sample ID written in indelible black ink as a backup for the label.

When practical, the project identification, sample matrix, laboratory designation/analyses requested, field sample identification code, and preservation will be typed or printed onto the label before sampling. Completion of the sample labels (including the field team staff's initials and the date and time of sample collection) will occur prior to filling the sample bottles. Labels will be completed in waterproof, indelible ink. Individual sample bottles will be properly labeled and securely sealed before being placed in the container for shipment to the laboratory (see SOP NC-14 – Sample Packaging and Shipping).

Samples are considered to be in one's possession if they are: 1) in the custodian's possession or view; 2) in a secured location (under lock) with restricted access; or 3) in a container that is secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s). Field COC procedures shall be followed from the time a sample is collected until it is relinquished to the analytical laboratory (either in person or to a shipper). The principal document used to track possession and transfer of samples is the COC form. A COC form shall be filled out in triplicate and initiated when the first sample is collected and updated continuously through the sampling event. A new COC form shall be prepared for each day of field sampling. Information to be entered on the COC form includes:

- Project identification (project and task number)
- Sample identification

- Time and date of sampling
- Sample matrix (i.e., sediment, water, air, etc.)
- Number of containers for each sample
- Analyses requested
- Preservative, if applicable
- Grab or composite sample designation, if applicable
- Signatures of field team staff/sample custodian
- Field team staff's remarks
- Destination (e.g., laboratory name and location)
- Page number (for example: 1 of 2, 2 of 2)
- Air bill or other shipping number
- Any special instructions

All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, then dating and initialing the change. Blank lines/spaces on the COC form will be lined-out, dated, and initialed by the individual maintaining custody. A COC form will accompany each cooler of samples to the analytical laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. One copy of the COC form should be placed in a waterproof bag and attached to the inside of each sample cooler. In the event that sediment subsamples are being sent to different laboratories, separate COC forms should be prepared for each laboratory and each sample cooler. A custody seal should be placed on the sample cooler when it is not in the custody of a member of the sampling team.

When samples are relinquished, either to the laboratory or for shipment, the COC form must be completed by the sample deliverer (except in the case of commercial carrier such as Fed Ex). It should include the printed and signed name of the deliverer, the organization that person represents, date and time of sample relinquishment, and method of shipment, if appropriate. A completed copy of the laboratory-verified COC form will be distributed via email or fax to the Project Chemist within 24 hours of sample receipt at the laboratory. The original will be retained by the laboratory.

Quality Assurance/Quality Control

Completed COC forms will be reviewed by the individuals preparing the samples for shipment for completeness, accuracy, and legibility. Specifically, the sample labels and COC record will be compared to ensure agreement between the samples and the COC and to verify the number of sample containers.

It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

List of Attachments

Attachment 1 – Chain of Custody Record and Laboratory Request Form

Chain of Custody Record & Laboratory Request Form COC#

ANCHOR QEA

Date:
Laboratory Number:
Project Name: **Newtown Creek RI**
Project Number:
Project Manager:
Phone Number:
Shipment Method:

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers																		Archive	Comments
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

1 See FSAP tables for analyte lists and test methods
2
3
4 BTEX includes total xylenes (para, meta, and ortho)
5 SPME- PAH includes 34 parent alkyl PAHs

6. AL = Atterburg Limits, MC= Moisture Content

7. SVOCs includes: 4-methylphenol, phenol, resin acids, guiacols

Additional notes/comments:

Relinquished By:	Company: Anchor QEA LLC.	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name	Date/Time	Signature/Printed Name	Date/Time

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

ATTACHMENT 1-NC-14
STANDARD OPERATING PROCEDURE
SAMPLE PACKAGING AND SHIPPING

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes procedures for packaging and shipping samples collected as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Sample packaging and shipping generally involves the placement of individual sample containers into a cooler with packing material and coolant in a manner that isolates the samples to prevent breakage, maintain required temperature, and limit the potential for damage to sample containers when the cooler is transported.

Procedures for sample packaging and shipping outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be summarized on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP

- Bound, waterproof field logbooks
- Black, ballpoint pen or Sharpies (or equivalent)
- Personal protective equipment (PPE) as required by the HASP
- Inert packing material (e.g., cardboard, bubble wrap, etc.)
- Pre-preserved sample containers as specified in the QAPP
- Sample labels
- Insulated coolers
- Custody seals
- Shipping tape
- Sealable Ziploc bags
- Temperature blanks (if not provided by the laboratory)
- Ice
- Overnight courier airbills or shipping forms
- Clear plastic sealing tape

Procedures

Observance of proper holding times and conditions during sample storage and shipment prior to laboratory analysis is critical to obtaining quality data from a sampling effort. Immediately after collection, samples (sediment and water) should be stored in refrigerators (if available) or ice-filled, insulated coolers with sufficient ice to maintain an ambient temperature of approximately 4°C until received by the analytical laboratory. Specific sample holding times and conditions for specific matrices and analyses are listed in the QAPP (Anchor QEA 2011b).

Individual sample containers (or groups of sample containers) should be stored in the coolers packed in Ziploc bags to prevent labels from smearing and falling off. Ice should be placed on top of samples inside the coolers.

Sample Shipping

All samples should be shipped or hand delivered to the analytical laboratory as soon as possible after completion of sampling to minimize the number of people handling samples and protect sample quality and security. The following guidelines apply to water and sediment samples that will be shipped by courier to the laboratory:

1. Shipping containers should be in good shape and capable of withstanding rough treatment during shipping.
2. Samples should be packed tightly with dividers (e.g., bubble wrap or cardboard) separating all glass containers and empty space within shipping containers filled so the jars are held securely.
3. Sample coolers should be packed with ice to maintain an ambient sample temperature of approximately 4°C until delivery to the analytical laboratory. Wet or synthetic ice can be used but either type should be packed in a manner that will preclude leaking inside the sample cooler. A temperature blank (supplied by the laboratory) can be placed in the sample cooler along with analytical samples.
4. All coolers must be leak-proof or lined with a leak-proof plastic liner. Leaking coolers will not be delivered by some couriers.
5. A chain-of-custody (COC) record for each shipping container should be filled out completely (See SOP NC-13 – Sample Custody).
6. The original COC (described above) record and analysis request should be protected from damage by sealing in a ziploc bag and placing inside the shipping container (taped to the underside of the cover).
7. A custody seal should be attached so that the shipping container cannot be opened without breaking the seal.
8. Shipping containers carrying glass sample containers should have a “this side up” label to ensure jars are transported in an upright position, and a “fragile-glass” label should be attached to the top of the container to minimize agitation of the samples.
9. Shipping containers should be sent by a carrier that will provide a delivery receipt (such as Fed Ex) to confirm that the contract laboratory received the samples and serve as a backup to the COC record.

Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 1-NC-15

STANDARD OPERATING PROCEDURE INVESTIGATION-DERIVED WASTE (IDW) HANDLING AND DISPOSAL

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: August 2, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the instructions for the proper disposal of investigation-derived waste (IDW) (i.e., sediment, water, personal protective equipment [PPE], and other potentially contaminated materials) generated during implementation of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek.

Procedures for IDW handling and disposal procedures outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- PPE as required by the HASP
- Department of Transportation (DOT) approved 55-gallon open-topped drums with lid

for collection of solids

- DOT-approved 55-gallon closed-top drums for collection of liquids
- 30-gallon garbage bags
- 5 to 10 gallon buckets or carboys to be used as satellite waste collection containers
- Chemical drums
- Pallets
- Drum pad
- Drum cart
- Bung tool to open closed-top drum
- Drum wrench to tighten open-top drum lids
- Acid and solvent spill kits
- Labels and tags
- Duct tape

Waste Disposal Procedures

Materials that are known or suspected to be contaminated with hazardous substances through the actions of sample collection or personnel and equipment decontamination are said to be IDW. These wastes are classified into three categories:

- Solid materials consisting of sediments, used core tubes, used PPE, and other materials used in the handling, processing, and storage of sediment
- Liquid wastes such as waste Study Area water and decontamination water
- Spent and residual chemicals (liquids) from decontamination.

Each type of material will be handled in a manner described in the SOP.

Solid Waste

Solid residual wastes generated during field activities will consist of two types of materials: sediment and non-sediment solids. Sediment wastes will include discarded core or grab samples and left over sediment from core and grab samples not used for sample analyses. Non-sediment wastes include items such as used core tubes and caps, aluminum foil, PPE (e.g., gloves, Tyvek® suits, and plastic sheeting). Non-sediment and sediment wastes will be segregated and stored in separate containers pending disposal. Loose sediment will be removed from non-sediment waste items prior to disposal to the extent practical.

Sediment residuals will be placed in 55-gallon drums, labeled, and stored temporarily pending characterization and transfer to an approved disposal facility. Non-sediment solid material will be placed in 30-gallon plastic bags and temporarily stored pending disposal.

Wastewater

Wastewater will be generated during sediment processing and decontamination activities. Sediments recovered during this process will be handled as solid waste as described above. Wastewater will be collected in 55-gallon closed-top drums until the material is characterized and transferred off site for disposal.

Chemical Liquid Waste

Chemical liquid wastes may include spent solvents generated during the decontamination process (refer to SOP NC-02 – Equipment Decontamination). Waste solvents will be collected in dedicated satellite containers as follows:

- Waste solvents (e.g., ethyl acetate) will be collected in (jacketed) glass solvent bottles, and labeled with a Class 3 Flammable Liquid label.

Waste containers will be stored in a secure location at the field facility until pickup by an authorized waste handler.

Both solid and liquid IDW will be generated at each sampling station. These materials will be segregated and containerized in closed 5-gallon buckets or trash bags, as appropriate, on the boat and secured for transport. Sediment generated at each sampling station will be containerized in 5-gallon buckets on the boat and secured for transport. The containers will be transported to the processing area for consolidation in 55-gallon drums for subsequent disposal. A composite sample from each drum will be collected and analyzed for compounds specific to the potential disposal facility.

Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check/ensure that the IDW handling and disposal procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 1-NC-16

STANDARD OPERATING PROCEDURE PHOTOIONIZATION DETECTOR CALIBRATION AND OPERATION

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) describes the procedure for using a photoionization detector (PID) during implementation of field tasks for the Remedial Investigation/Feasibility Study (RI/FS) for the Newtown Creek. The PID is a portable, non-specific, vapor/gas detector employing the principle of photoionization to detect a variety of chemical compounds, both organic and inorganic, in air.

Procedures for equipment decontamination outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP and the corresponding documents (e.g., HASP, Quality Assurance Project Plan [QAPP], and Field Sampling and Analysis Plan [FSAP] [Anchor QEA 2011a, b, and c]). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read and be familiar with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and corresponding documents (Anchor QEA 2011a, b, and c). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- PID
- Calibration gas cylinder
- Model-specific operations manual

- 11.7 eV probe
- Battery charger for PID
- Daily log for documentation of calibration, sample logs

Procedures

Start up and Calibration

Check out and ensure the proper operation of the PID as appropriate, using the equipment checklist provided below:

1. Allow the unit to calibrate to the surrounding temperatures (approximately 5 minutes)
2. Follow the start-up procedure detailed in the operation manual
3. Set the PID to calibration mode
4. Attach a regulator to a disposable cylinder of calibration gas
5. Follow the procedure detailed in the operation manual to calibrate the detector; if the meter reading is greater than + or - 15% of the responses value of the calibration gas used, the instrument should be red tagged and not used until fixed

Operation

All readings are to be recorded on the matrix-specific field forms. The following procedures pertain to all aspects of the field sampling program.

1. Position the probe assembly close to the area to be monitored because the low sampling rate allows for only very localized readings. Under no circumstances should the probe tip come in contact with the sample.
2. Monitor the breathing zone of the work area as specified in the HASP.
3. When designated, take readings of the sample when first collected and record any readings on the appropriate field form.
4. When the activity is completed, carefully clean the outside of the PID with a damp disposable towel to remove any visible dirt.
5. Turn the unit off as directed by the operation manual and recharge the battery.

Quality Assurance/Quality Control

It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek. June.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 1-NC-17

STANDARD OPERATING PROCEDURE MULTI-PARAMETER WATER QUALITY DATA COLLECTION

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

The objective of this standard operating procedure (SOP) is to describe the collection of water quality data from a boat during sampling for the Remedial Investigation/Feasibility Study (RI/FS) for the Newtown Creek Study Area. Instruments capable of recording in-situ data will be used for data collection. Instruments will be equipped with sensors including temperature, conductivity, dissolved oxygen (DO), pH, and turbidity. Specific information regarding water quality data collection can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for water quality data collection in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded summarized on the Daily Activity Log and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical and chemical hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Specialized training is not required for the operation of the multi-parameter instrumentation; however, field staff will be supervised by experienced staff prior to first use of the equipment.

Equipment and Supplies

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Approved documents including FSAP, QAPP, and HASP
- Appropriate personal protective equipment (PPE) and clothing as defined in the project HASP
- Decontamination equipment described in SOP NC-02 – Equipment Decontamination
- Field note book
- Standardized field log forms (Field forms and calibration logs)
- Black, ballpoint pen or Sharpies (or equivalent)
- Multi-parameter water quality meter and manufacturer's operating manual
- Meter probe cable (minimum 50-foot length)
- Hand held data logger (Hydrolab Surveyor or equivalent)
- Calibration standards:
  - pH (4.0, 7.0, and 10.0 standard buffer solutions)
  - Conductivity
  - Turbidity standards (0 NTU, 40 NTU, and 100 NTU)
  - Miscellaneous others (as necessary)
- Paper towels
- Deionized (DI) water
- Weighted line

Calibration Procedures

Prior to use in the field, the instrument will be examined to ensure that it is in good working order. Calibration procedures will be performed prior to use in accordance with the manufacturer's specifications. Calibration standards as specified in the Manufacturer's operations manual will be used. Calibration will be documented on an instrument calibration form (Attachment 1).

General Calibration Procedures:

1. Rinse the sensor in DI water and a small amount of calibration solution prior to calibration.
2. Submerge the sensor in the calibration standard and gently move the instrument up and down a few times to clear air bubbles near the sensor.
3. Allow at least one minute for the probe to acclimate.

4. Fix the calibration value once it has stabilized.
5. Record the calibration standard and value on the calibration worksheet.
6. Rinse the probe with DI water.
7. Repeat above procedure for two or three-point calibrations, as directed by the instrument manual and/or following on-screen instructions

The instrument will be inspected and a post-survey calibration check may be performed at the end of each day's activities to confirm that the instrument functioned properly throughout the day. The instrument will also be checked during the day if erratic or suspect readings are observed.

Field Data Collection

The FSAP provides the water quality measurement need for each task (e.g., discrete measurements or profile information). After the sensors are calibrated, field data may be collected by using the hand-held data logger. Procedures for water quality measurement and profiling are presented in SOP NC-11 – Water Column Profiling and Sample Collection. Field staff will adhere to the methods described in the instrument manual regarding sensor procedures.

Ongoing calibration checks against standard solutions will be made periodically throughout the day and between stations as deemed necessary by the Field Sampling Lead based on equipment observations and any potentially anomalous readings. If the meter registers outside user manual-specified accuracy upon calibration check, the instrument will be recalibrated prior to continuing with the monitoring event.

Monitoring equipment will be handled according to manufacturer's recommendations. Unusual or questionable readings will be noted and duplicate readings made. Any maintenance required in the field will be performed as needed following procedures described in the manufacturer's instruction manual. Calibration information and a description of maintenance performed will be recorded on the field data forms.

During field operations, the instrument will be protected from temperature extremes and extended periods of direct sunlight. The instrument will be kept in a bucket of water between stations to protect the DO sensor. Once deployed on station, the sensor display will be allowed to stabilize (particularly for pH and DO) prior to collecting data.

The water quality meter probe and cable should be decontaminated between stations when used for in-situ measurements, and at the end of each day in accordance with the manufacturer's specifications and SOP NC-02 – Equipment Decontamination.

Quality Assurance/Quality Control

Quality control procedures will consist of following standard instrument operation procedures for instrument calibration and making in situ water quality measurements. Adherence to these procedures will be complemented by periodic and routine equipment inspection and calibration. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

List of Attachments

Attachment 1 – Hydrolab Calibration Worksheet

Attachment 2 – Water Sampling Instrument Pre-Deployment Testing Log

HYDROLAB CALIBRATION WORKSHEET

PROJECT(S): Newtown Creek PROJECT #:

REMINDER: ALLOW TWO MINUTES WARMUP BEFORE CALIBRATION OR USE.

			DO				pH					REDOX		
Calib by:	Date	Time (24 Hr)	Temp. (°C)	BP (mm Hg)	Initial DO (mg/L)	Final DO (mg/L)	Initial pH 7.0	Final pH 7.0	Temp. (°C)	Initial pH:	Final pH:	Initial (mV)	Final (mV)	Temp. (°C)

			CONDUCTIVITY					TURBIDITY				
Calib by:	Date	Time (24 Hr)	Initial 0 µs/cm	Final 0 µs/cm	Temp. (°C)	Initial 1412 µs/cm	Final 1412 µs/cm	Initial 0 NTU	Final 0 NTU	Temp. (°C)	Initial ____NTU	Final ____NTU

Dissolved Oxygen Method (circle one):

Air Saturated Water Winkler Titration

Source of Barometric Pressure: Surveyor 4

Turbidity Std (____NTU)

Lot#______________________ Exp. Date: ____________

Turbidity Std (____NTU)

Lot#______________________ Exp. Date: ____________

Conductivity Stds: Calibration: _________________µs/cm

Lot #____________________________ Exp. Date: ________________

Verification: _________________µs/cm

Lot #____________________________ Exp. Date: ________________

pH Buffers:

pH 4 Lot #_________________ Exp. Date: ________________

pH 7 Lot#___________________ Exp. Date: ________________

pH 10 Lot#___________________ Exp. Date: ________________

Redox Standard: 428 mV ± @ 25 °C (Zobell's)

Lot#______________________ Exp. Date: ________________

NOTES:

Water Sampling Instrument Pre-Deployment Testing Log

Project: Newtown Creek	Location:
Project No:	Date:
Field Staff:	List of Sensors:
Instrument Make/Model:	Instrument Serial No:
Sensor Make/Models:	Sensor Serial Numbers:
Weather Conditions:	Sea State:
Water Depth - lead line (m):	Start Time:
Data file name:	End Time:

Notes:

ANCHOR QEA

ATTACHMENT 1-NC-18

STANDARD OPERATING PROCEDURE
FISH COMMUNITY SURVEY

Prepared by

Anchor QEA, LLC

305 W Grand Avenue, Suite 300

Montvale, New Jersey 07645

Revision Date: July 11, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection and processing of fish community survey samples as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Specific information regarding fish community survey sampling can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for fish community survey outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log, and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Sampling vessel equipped with necessary navigation, communication, and collection method.
- Personal protective equipment (PPE) as required by the HASP including personal floatation devices (PFDs)

- Approved documents including FSAP, QAPP, and HASP
- Fish Community Survey field forms and chain-of-custody (COC) forms
- Black, ballpoint pen or Sharpies (or equivalent)
- Digital camera
- Target sample coordinates
- Aluminum foil
- Deionized (DI) water
- Surgical forceps
- White board and marker
- Sample containers (refer to QAPP and FSAP)
- Sample labels (inside and outside)
- Sample preservation chemicals
- Ruler and tape measure

Sampling Procedures

This section provides step-by-step procedures for the collection of fish community samples associated with the water column profiling sampling event.

Station Positioning

The sampling schedule for the day will be established prior to boat departure, and sufficient equipment to complete the work will be mobilized onto the boat. The vessel will be moved to the grab station using procedures described in SOP NC-04 – Navigation and Boat Positioning.

Sampler Deployment and Retrieval Procedures

1. Don appropriate PPE as described in the HASP.
2. Determine the appropriate equipment to be used for sample collection requirements prior to field mobilization. Discuss safety issues involved in sampler usage.
3. Motor to the target station and record the station location coordinates and water depth on the appropriate data collection form.
4. Collect a water column profile as proscribed in SOP NC-11 – Water Column Profiling and Sample Collection.

5. Perform the fish survey with the collection method decided upon through professional judgment, taking into account ship traffic and mortality rate. Options include otter trawls, traps, gill nets, and trot lines.
6. Sample Collection Procedures
   a. Otter Trawls: An otter trawl will be used at stations within the main channel of Newtown Creek and in areas where passive gear (i.e., gill nets) may interfere with vessel traffic and operations. The following steps will be taken during deployment and/or net retrieval:
      1. Position vessel and record deployment location using vessel DGPS.
      2. Fasten each wing line to transom cleats. Ensure cod end of net is closed and tied.
      3. With vessel underway slightly above idle, deploy the net maintaining even alignment of otter doors. Annotate the start time in the field logbook.
      4. Once deployed, tow gear along a predetermined track and distance. Maintain an approximate 5:1 ratio of towrope length to station depth.
      5. When tow is complete, stop the vessel, and pull net aboard from either side of the vessel. Record retrieval position with DGPS, average vessel speed, duration of tow, and time of retrieval.
      6. When net is on board, untie the cod end and empty contents into designated bins or baskets. Check the interior of the net and wings for species that may be entangled.
      7. Process fish as described below and prepare for next tow.
   b. Gill Nets: Gill nets will be used only at stations that will not interfere with vessel traffic and operations. Gill nets between 50 and 100 feet in length, each having up to six panels with mesh sizes of 1.0 inch (in)., 1.5 in., 2.0 in., 2.5 in., 3.0 in., 3.5 in., and 4.0 in. will be used. Nets will be equipped with lead weights and floats designed to hold the net vertically in the water column. Gill nets will be deployed perpendicular to shore. The following protocols will be followed, as practical, for collection of fish with gill nets:
   1. Position vessel and record deployment location using vessel DGPS.
   2. Attach floats and anchor weights to surface float lines and bottom lead lines of gill nets.

3. Deploy gill nets perpendicular to shore/current from bow of vessel while vessel is in reverse (or stern with vessel forward). Record the time, location of deployment, net length, and net position (north to south) in field logbook.
4. Retrieve gill nets after the desired sample duration by approaching the net from the downwind/downcurrent end and slowly pull the net into the vessel.
5. Stack the incoming gill net into a container while carefully removing fish as the net is pulled onto the vessel.
6. Process fish as described below.

c. Baited Minnow Traps and Crab Traps/or Pots: Baited minnow and crab traps will either be deployed individually or in a series. Each deployment will be individually marked by a buoy. A buoy will mark the start and end of each series. Buoys will not be located in the navigable channel. Traps will be weighted with appropriate weights and buoyed with a line of sufficient length to account for changes in the tide. Baited traps will be preferentially deployed during the day on incoming tides as practical, or deployed in the late afternoon or evening hours and retrieve the following morning. The following steps will be taken during deployment and/or retrieval of minnow traps and/or crab pots:
   1. Position vessel and record deployment location using vessel DGPS.
   2. Place the bait into a mesh bag and place the bag in the bait basket of the trap or hook onto the inside center of the trap.
   3. Attach a buoy to the end of the trap line and ensure the trap line is sufficiently long to account for changes is water depth during deployment period.
   4. Lower the trap into the water over the side of the vessel. Ensure the trap is securely anchored on the bottom. The buoy should be clearly visible to allow for ease of retrieval.
   5. Note the time of deployment, type of trap used, and location of deployment in the field logbook.
   6. Retrieve traps by hand or winch from the side of the vessel.
   7. Empty each trap into an individual holding bin or basket.
   8. Process fish as described below.

d. Trot Lines: If trot lines are used, each trot line will consist of a main line with baited size 4 to 6 hooks. Trot lines will be deployed from the vessel generally set perpendicular to the shore. An anchor and float line will be attached to each end of the main line, and the trot line will be set overnight. Buoys will not be set in navigable waterways. The following procedures will be followed when deploying and/or retrieving trot lines:

1. Position vessel and record deployment location using vessel DGPS.
2. Trot lines will be set perpendicular to shore.
3. The start of the rig will be set using an anchor or attached to a shore line structure. The line will be fed out slowly baiting each hook to the endline.
4. Attach a weight with a float line at the endpoint making sure line remains taut.
5. Note the time and location of deployment and retrieval in the field log book.
6. Upon retrieval, unhook any fish caught and place into a clean holding container. Process fish as described below.

7. Sample Processing

Fish will be processed on the boat. Processing for the first 20 fish of each species collected will include:

e. Identifying each species
f. Weighing and measuring of each species
g. Recording external abnormalities
h. The sex of blue crab
i. Photograph fish with questionable identification for later examination

Once individual processing is complete, live specimens will be released back into the waterbody. Dead specimens will be disposed of as IDW (SOP NC-15)

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

Attachments

Attachment 1 – Fish Community Log

Fish Community Log

ANCHOR QEA

Job: Newtown Creek RI

Job No:	Collection Date:
Station ID:	Collection Time:
Field Staff:	Collection Method:
Total # of fish collected at station:	

Fish #	Time	Fish Length (cm)	Whole fish wet weight (blotted)	Species	Notes

ATTACHMENT 1-NC-19

STANDARD OPERATING PROCEDURE ACOUSTIC DOPPLER CURRENT PROFILER (ADCP)

Pending – To be submitted at a later date, after the selection of the subcontractor responsible for the activity.

ATTACHMENT 1-NC-20

STANDARD OPERATING PROCEDURE AIR MONITORING FOR POLYCHLORINATED BIPHENYLS

Pending – To be submitted at a later date, after a preliminary reconnaissance of suitable sampling locations is conducted in the area.

ATTACHMENT 1-NC-21

STANDARD OPERATING PROCEDURE AIR MONITORING FOR VOLATILE ORGANIC COMPOUNDS

Pending – To be submitted at a later date, after a preliminary reconnaissance of suitable sampling locations is conducted in the area.

ATTACHMENT 1-NC-22
STANDARD OPERATING PROCEDURE
BENTHIC COMMUNITY SURVEY

Prepared by
Anchor QEA, LLC
305 W Grand Avenue, Suite 300
Montvale, New Jersey 07645

Revision Date: August 4, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is applicable to the collection and processing of benthic community survey samples as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Specific information regarding benthic community survey sampling can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for surface sediment grab sampling outlined in the SOP are expected to be followed. Substantive deviations from the procedures detailed in the SOP will be recorded on the Daily Activity Log, and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, pending field conditions.

- Sampling vessel equipped with necessary navigation, communication, and grab deployment equipment.
- Personal protective equipment (PPE) as required by the HASP including personal

floatation devices (PFDs)

- Approved documents including FSAP, QAPP, and HASP
- Bound, waterproof field log books
- Black, ballpoint pen or Sharpies (or equivalent)
- Digital camera
- 0.5 meter^2 Eckman sampler, or modified 0.5 meter^2 Eckman sampler (preferred device), or a modified Van Veen sampler, Petit Ponar sampler, or similar sampling device
- Target sample coordinates
- Water pump and hoses
- Tripping messenger
- Stainless steel bowls and spoons (or equivalent)
- Appropriate field sieving equipment
- Digital camera
- Surgical forceps
- 10% formaldehyde and Borax or pre-mixed 10% buffered formalin solution
- Funnel
- Parafilm
- White board and marker
- Sample containers (refer to QAPP and FSAP)
- Sample labels (inside and outside)
- Sample preservation chemicals
- Ruler and tape measure

Sampling Procedures

This section provides step by step procedures for the collection of sediment surface samples associated with the benthic community survey.

Benthic samples will be collected using the same equipment and generally the same procedures as for the sediment sampling activities associated with samples for chemical analysis. Surface grab samples for chemistry analysis will be collected using procedures described in SOP NC-05 – Sediment Grab Sampling. These surface grab sediment samples for chemistry analysis will be collected from the same 15-cm interval as the benthic community survey samples. Grabs that are recovered with less than 15.0 cm of penetration will be discarded and the station will be resampled. Three discrete samples will be collected for each benthic community survey station from three separate grab samples. Samples from these three grab samples will not be composited. A 0.05-meter^2 Eckman sampler will be used to collect samples for benthic invertebrate, except where this device is unable to collect a sample. In these instances, an alternative grab sampler such as a van Veen will be used and data will be caveated appropriately for comparative purposes.

Station Positioning

The sediment sampling schedule for the day will be established prior to boat departure, and sufficient equipment to complete the work will be mobilized onto the boat. The vessel will be moved to the grab station using procedures described in SOP NC-04 – Navigation and Boat Positioning.

Sampler Deployment and Retrieval Procedures

1. Don appropriate PPE as described in the HASP.
2. Determine the appropriate equipment to be used for sediment collection requirements prior to field mobilization. Discuss safety issues involved in sampler usage.
3. Slowly lower the grab to the sediment surface either by hand or under winch control. Deployment speeds can be adjusted according to various sediment types (i.e., soft sediments require a slower deployment to avoid over filling the grab devise). Nearing the bottom travel time will not exceed 1 meter/sec to minimize bow wave disturbance.
4. Once on the bottom, give the grab sufficient slack to allow the tripping mechanism to release. In the case of the Ekman grab, maintain sufficient tension for the tripping messenger to glide smoothly along the line to trip the sampler.
5. Record the station location coordinates and the water depth on the appropriate data collection form.
6. Upon retrieval of the grab to the water surface, maintain ergonomic control. When hand lifting, lift into the vessel or lift the grab high enough to place on a stable

surface on the sampling vessel. When lifting onto the vessel, use care not to disturb the sample by banging against the side of the vessel.

7. After the grab sampler is retrieved on board and placed in a stable position, open the sampler and examine it for acceptability checking that:
    a. Sampler is not overfilled (i.e., there is no sediment surface against top doors of sampler)
    b. Sediment surface is intact and relatively flat, indicating minimal disturbance or winnowing
    c. Overlying water has low turbidity, indicating minimal sample disturbance
    d. Desired penetration depth has been achieved
    e. Grabs that are partially filled, or obviously slumped or pitched due to the sampler hitting at an angle are not considered acceptable. Unacceptable sample material must be retained and treated as Investigation Derived Waste (IDW) in accordance with SOP NC-15 – Investigation Derived Waste Handling and Disposal.
8. If the sample is rejected, empty the grab sample, placing the discarded sediment into an IDW labeled waste container, then wash the grab sampler thoroughly with site water and re-cock the sampler. Decontamination procedures are not required when the grab sampler is redeployed at the same sampling location. The sampling procedure is repeated until an acceptable grab sample is obtained.
9. Record the sample date and time, penetration depth, and other field parameters defined on the benthic sample collection form. From acceptable grabs, the following will be documented: color, odor, biota, sediment texture, apparent redox potential discontinuity, penetration depth, and any comments relative to sample quality (i.e., winnowing, leakage, or disturbance). In addition, any anomalies such as sheen, slick, large rocks, or foreign objects will be noted. If the grab sample is rejected, record the reason on the benthic sample collection form.

Collection of the Benthic Community Sample from the Grab

1. The entire sample will be sieved for benthic infaunal analyses.
2. After qualitative characteristics of the sample have been recorded, sediment from the grab sampler will be washed on a 0.5 mm sieve.

3. Sediment adhering to the outside of the sampler should not be mixed with the sample.
4. When being sieved, sediments may be gently sprayed with water from above, gently agitated by hand in a washtub of water (in an up-and-down, not swirling, motion), or washed using a combination of these techniques.
5. For all methods, it is imperative that the samples be washed gently to minimize specimen damage.
6. If rocks, trash, or larger non-organic pieces of debris are caught in the sieve, rinse thoroughly over the sieve and carefully remove from the sample.
7. Wash water should be filtered or screened through mesh with openings less than one-half the size of the sieve.
8. Once sieving is completed, the screen box should be held at an angle and the remaining material gently washed into one corner.
9. The sample may then be transferred to a container for immediate fixation, using as little water as possible.
10. Be sure to check the screen for organisms trapped in the mesh wires carefully using forceps if needed, taking care not to damage the screen.
11. Place a permanent internal sample label in the container at this time. After the screen has been checked, back wash the screen with a high-pressure spray to dislodge any sediment grains that may be caught in the mesh.
12. To prevent the possibility of breakage, plastic jars and plastic lids will be used to store and ship samples.
13. An identical sample label will be place on the external surface of the sample jar at this time.
14. Once the entire sample has been sieved and collected in the sample jar, preserve with 10% formaldehyde (described below).
15. Fill the jar slightly below the threads to ensure all specimens are submerged. After fixative has been added to a sample container it is critical that the contents be mixed adequately by inverting the container several times.
16. After being stored for approximately 1 hour, samples should be inverted several times again to ensure adequate mixing.

Fixative Preparation

1. The fixative most commonly used for benthic macroinvertebrate samples is formalin, an aqueous solution of formaldehyde gas.
2. Under no circumstances should ethyl or isopropyl alcohol (i.e., preservatives) be used in place of the formalin.
3. Penetration of the alcohol into body tissues is too slow to prevent decomposition of the specimens.
4. A formalin solution of 10 to 15% (v/v) strength will be used as a fixative.
5. The formalin solution should always be buffered to reduce acidity to prevent decalcification of mollusks and echinoderms (PSEP 1987).
6. Borax (sodium borate, $Na_2B_4O_7$) should be used as the buffer to prevent leaving a precipitate on body tissues and setae as other buffering agents may leave.
7. To prepare a 10% buffered formalin solution, add 4 ounces of borax to each gallon of concentrated formalin (i.e., a 40% solution of formaldehyde in water).
8. This amount will be in excess, so use the clear supernatant when making seawater dilutions.
9. Dilute the concentrate to a ratio of one part concentrated formalin to nine parts seawater.
10. Seawater will further buffer the solution. Seawater also makes the fixative isotonic with the tissues of the animals, thereby decreasing the potential for animal tissues to swell and break apart, as often happens with freshwater dilutions of formalin.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August 2011.

PSEP, 1987. Recommended Protocols for Sampling and Analyzing Subtidal Benthic Macroinvertebrate Assemblages in Puget Sound: Final Report. Prepared by Tetra Tech, Inc. for U. S. Environmental Protection Agency Region 10, Office of Puget Sound.

ATTACHMENT 1-NC-23
STANDARD OPERATING PROCEDURE
SHORELINE HABITAT SURVEY

Prepared by
Anchor QEA, LLC
305 W Grand Avenue, Suite 300
Montvale, New Jersey 07645

Revision Date: August 3, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is specific to conducting shoreline habitat surveys as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Specific information regarding the shoreline habitat survey can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for the shoreline habitat survey outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log, and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, based on field conditions.

- Sampling vessel equipped with necessary navigation and communication equipment.
- Personal protective equipment (PPE) as required by the HASP including personal floatation devices (PFDs)
- Approved documents including this SOP, the FSAP, QAPP, and HASP

- GPS unit appropriate for data collection/recording coordinates and shapes
- Black, ballpoint pen or Sharpies (or equivalent)
- Field log book
- Digital camera
- Figure of the survey area
- Deionized (DI) water
- White board and marker
- Ruler and tape measure
- Sample containers and labels for opportunistic water samples
- Decontamination supplies

Survey Procedures

This section provides step-by-step procedures for conducting the shoreline habitat survey.

The sampling schedule for the day will be established prior to boat departure, and sufficient equipment to complete the work will be mobilized onto the boat. The vessel will survey the shoreline using procedures described in SOP NC-04 – Navigation and Boat Positioning.

Shoreline habitat survey procedures are as follows:

1. Don appropriate PPE as described in the HASP.
2. Check in with the Field Team Leader to confirm schedule and area to be surveyed. Collect communications equipment and opportunistic sampling supplies.
3. Motor to the beginning of the survey area and record the starting location using the GPS unit.
4. Begin data collection which description and GPS coordinates of the following shoreline attributes:
   a. Identification of aquatic and riparian habitat type
   b. Identification of shoreline type (intertidal, bulkhead, and riprap)
   c. Description of cover types, including typical vegetative species and invasive, rare, or protected plants
   d. Identification of wetland type(s) and stream classifications
      i. Record upstream and downstream extents and approximate width

   e. Identification of typical fish and wildlife species observed for each cover/wetland type, endangered, threatened, and rare species, or species of special concern
   f. Observations of stress (e.g., presence of seeps, dead or dying vegetation)
   g. Identification and locations of outfalls, seeps, and sheens
   h. Vessel traffic (indicate type and approximate size)
   i. Location of accumulations of floatables
5. Take digital photographs of shoreline attributes and record collection in the electronic data form.
6. Continue collecting data (steps 4 and 5) along the study area.
7. If a shoreline is not accessible by boat due to channel conditions or obstructions, collect a GPS offset or digitized location of the shoreline.
8. At the end of the day, return equipment and records to the field facility.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August 2011.

ATTACHMENT 1-NC-24
STANDARD OPERATING PROCEDURE LAND-SIDE HABITAT SURVEY

Prepared by
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Montvale, New Jersey 07645

Revision Date: August 3, 2011

STANDARD OPERATING PROCEDURE ACKNOWLEDGEMENT FORM

Project Number: 110782-01.01 Project Name: Newtown Creek RI/FS

My signature below certifies that I have read and understand the procedures specified in this Standard Operating Procedure.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Scope and Application

This Standard Operating Procedure (SOP) is specific to conducting land-side habitat surveys as part of the Remedial Investigation/Feasibility Study (RI/FS) for Newtown Creek. Specific information regarding the land-side habitat survey can be found in the associated Field Sampling and Analysis Plan (FSAP) (Anchor QEA 2011c) and the Quality Assurance Project Plan (QAPP) (Anchor QEA 2011b).

Procedures for the land-side habitat survey outlined in this SOP are expected to be followed. Substantive deviations from the procedures detailed in this SOP will be recorded on the Daily Activity Log, and recorded on a Field Change Report (see SOP NC-01 – Field Records).

Health and Safety Warnings

Health and safety issues for the work associated with this SOP, including physical, chemical, and biological hazards, are addressed in the project Health and Safety Plan (HASP) (Anchor QEA 2011a). The HASP will be followed during all activities conducted by Anchor QEA personnel as part of the Newtown Creek RI/FS.

Personnel Qualifications

Field personnel executing these procedures will have read, be familiar with, and comply with the requirements of this SOP, the RI/FS Work Plan (AECOM 2011), and the corresponding documents (e.g., HASP, QAPP, and FSAP (Anchor QEA 2011a, b, and c). Additionally, field personnel will be under the direct supervision of qualified professionals who are experienced in performing the tasks required for sample collection.

Equipment and Materials

The following is a list of equipment that may be necessary to carry out the procedures contained in this SOP. Additional equipment may be required, based on field conditions.

- Personal protective equipment (PPE) as required by the HASP
- Approved documents including this SOP, the FSAP, QAPP, and HASP
- GPS unit appropriate for data collection/recording coordinates and shapes
- Black, ballpoint pen or Sharpies (or equivalent)

- Field log book
- Digital camera
- Figure of the survey area

Survey Procedures

This section provides step-by-step procedures for conducting the land-side habitat survey.

The survey schedule for the day will be established prior to departure and sufficient equipment to complete the work will be mobilized. Using the results of the aerial photography and hydrographic surveys, the land-side survey will ground truth features within one quarter mile that may have an impact on the Study Area. The survey will be through accessible (i.e., public areas) areas and will consist of preparing maps showing general habitat, including: paved and sterile; paved with gravel and sparse weeds: gravel; dirt and rubble with weeds; recovering marsh; shrub and scrub; bank with riparian vegetation; wet spots, etc. Special attention will be made areas that may qualify as a wetland.

Land-side habitat survey procedures are as follows:

1. Don appropriate PPE as described in the HASP.
2. Check in with the Field Team Leader to confirm schedule and area to be surveyed. Collect communications and data collection equipment.
3. Mobilize to the beginning of the survey area and record the starting location using the GPS unit
4. Begin data collection, which includes descriptions and GPS coordinates of the following habitat attributes:
   a. Upland habitat type (i.e., above mean higher high water) and aquatic and riparian habitat type (e.g., intertidal, bulkhead, and riprap)
   b. Vegetation type, including emergent vegetation, invasive species, and stressed vegetation
   c. Identification of typical fish and wildlife species observed for each cover/wetland type, endangered, threatened, and rare species, or species of special concernSurface cover type (i.e., if paved, soil, etc.)
   d. Outfalls, seeps, and sheens identified during the shoreline survey

5. Take digital photographs of land-side attributes and record collection in the electronic data form.
6. Continue collecting data (steps 4 and 5) along the study area.
7. At the end of the day, return equipment and records to the field facility.

Quality Assurance/Quality Control

Entries in the field forms will be double-checked by the field team staff to verify the information is correct. It is the responsibility of the Field Team Leader to periodically check to ensure that the procedures are in conformance with those stated in this SOP.

References

AECOM, 2011. Remedial Investigation/Feasibility Study Work Plan, Newtown Creek, June, 2011.

Anchor QEA, 2011a. Health and Safety Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011b. Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, Newtown Creek. July, 2011.

Anchor QEA, 2011c. Field Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, Newtown Creek. August, 2011.

ATTACHMENT 2
BRIDGE CONSTRAINTS/CONTACTS

Attachment 2
Bridge Constraints/Contacts

Mile Above Mouth of Newtown Creek	Bridge	Waterbody	Owner	Contact for Opening	Type	Horizontal (feet)	Vertical MLW (feet)	Vertical MHW (feet)	Use
0.6	Pulaski Bridge	Newtown Creek	New York City	New York City Department of Transportation (NYCDOT) Radio Hotline or NYCDOT Bridge Operations Office	Bascule	150	43	39	Highway
1.1	Long Island Railroad Swing	Dutch Kills	Long Island Railroad	Not applicable	Swing (*)	46	5	2	Railroad
1.15	Long Island Railroad	Dutch Kills	Long Island Railroad	Not applicable	Bascule (*)	50	19	14	Railroad
1.2	Borden Avenue	Dutch Kills	New York City	NYCDOT Radio Hotline or NYCDOT Bridge Operations Office	Retractile	49	9	4	Highway
1.23	Long Island Expressway	Dutch Kills	New York City	Not applicable	Fixed	90	94	90	Highway
1.4	Hunters Point Avenue	Dutch Kills	New York City	NYCDOT Radio Hotline or NYCDOT Bridge Operations Office	Bascule	60	13	8	Highway
1.31	Greenpoint Avenue (JJ Byrne Memorial Bridge)	Newtown Creek	New York City	NYCDOT Radio Hotline or NYCDOT Bridge Operations Office	Bascule	149	31	26	Highway
1.95	Kosciuszko Bridge	Newtown Creek	New York State Department of Transportation	Not applicable	Fixed	249	129	125	Highway
3.1	Grand Avenue Bridge	East Branch	New York City	NYCDOT Radio Hotline or NYCDOT Bridge Operations Office	Swing	58	15	10	Highway
3.4	Grand Street/Metropolitan Avenue	English Kills	New York City	NYCDOT Radio Hotline or NYCDOT Bridge Operations Office	Bascule	86	15	10	Highway
3.8	Long Island Railroad Montrose Avenue	English Kills	Long Island Railroad	Not applicable	Swing (*)	46	9	4	Railroad

Notes:
(*) bridge is currently functionally a fixed bridge
Mariners should monitor marine radio channel #16 for news from the U.S. Coast Guard on special circumstances affecting the operation of movable bridges.
To request a NYCDOT-owned bridge opening for a vessel, thre are three options. (1) call the NYCDOT Bridge Operator on marine radio channel #13, (2) call the DOT Bridge Operations Office at (212) 371-7836, or (3) call the NYCDOT Communications Center at (718) 433-3340. While no permits are required for an opening, for most bridges the regulations state that two to four-hour notifications must be provided.
MLW - Mean Low Water
MHW - Mean High Water

Sources: New York State Department of Transportation, 2005. Newtown Creek Navigation Analysis, September 22; http://www.nyc.gov/html/dot/html/bridges/bridgelist.shtml.